DOCUMENT RESUME

ED 444 014 CE 080 583

AUTHOR	Harrington, Lois G.
TITLE	Making Connections: A Curriculum Ideabook for Teachers of Applied Academics and Health Services.
INSTITUTION	Ohio State Univ., Columbus. Center on Education and Training for Employment.
SPONS AGENCY	Department of Labor, Washington, DC.
PUB DATE	2000-00-00
NOTE	275p.; Project administered through the Buckeye Hills Collaborative Partnership, Gallia/Jackson/Vinton JVSD, Rio Grande, Ohio.
CONTRACT	CFDA-278G
AVAILABLE FROM	Center on Education and Training for Employment, 1900 Kenny Road, Columbus, OH 43210-1090, Tel: 800-848-4815, ext. 24277, Fax: 614-292-1260, Web site: http://www.cete.org/products (TWEX-06, $30).
PUB TYPE	Guides - Non-Classroom (055)
EDRS PRICE	MF01/PC11 Plus Postage.
DESCRIPTORS	Academic Education; Allied Health Occupations; Allied Health Occupations Education; Classroom Techniques; *Communications; *Dental Assistants; Education Work Relationship; Educational Resources; *Integrated Curriculum; Internet; Job Skills; Learning Activities; *Mathematics; *Medical Assistants; Nurses Aides; Occupational Information; Performance Based Assessment; Postsecondary Education; *Sciences; Teaching Guides; Teaching Methods; Tech Prep; Vocational Education
IDENTIFIERS	Secretarys Comm on Achieving Necessary Skills

ABSTRACT

This Ideabook is designed to help vocational/tech prep and applied academics teachers plan and present their subject matter in a more integrated way. Section 1 discusses integrating the curriculum, rationale for using the curriculum, and how the book helps teachers modify their instructional programs to more closely match demands and realities of the real world. Secretary's Commission on Achieving Necessary Skills (SCANS) competencies and SCANS foundation skills and qualities are listed. Section 2 looks at the three levels of integration: infusion; linked; and multidisciplinary. Section 3 presents strategies and activities a teacher can use to make academic instruction more integrated, divided into these areas: teach thinking strategies; use authentic assessment tools; use rubrics and periodicals; simulate the workplace; incorporate projects; use demonstrations and discovery; use planning tools that support integration; and devise joint plans with other teachers. Section 4, focusing on the information superhighway, covers the Internet, World Wide Web, e-mail, newsgroups, mailing lists, and Web sites. Section 5 describes curricular resources for applied communications, mathematics, and science; applied communications; applied mathematics and science; applied mathematics; applied science. Contact information is also provided. Section 6 contains excerpts from the Occupational Competency Analysis Profile for diversified health occupations. (YLB)

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Making Connections:

A Curriculum Ideabook for Teachers of Applied Academics and Health Services

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This publication was funded by a School-to-Work Opportunities: Urban/Rural Opportunities Grant (CFDA #278G) from the U.S. Department of Labor. The Project was administered through the Buckeye Hills Collaborative Partnership, Gallia/Jackson/Vinton JVSD, Rio Grande, Ohio. The content does not necessarily reflect the views of the Department or any other governmental agency.

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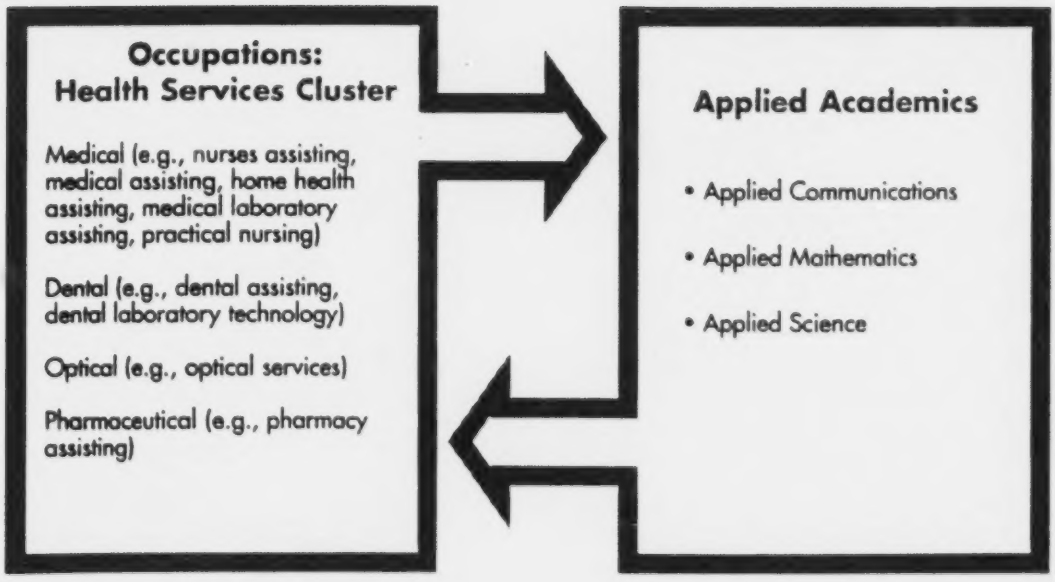
Making Connections: A Curriculum Ideabook for Teachers of Applied Academics and Health Services

Center on Education and Training for Employment
College of Education; The Ohio State University
1900 Kenny Road
Columbus, Ohio 43210-1090

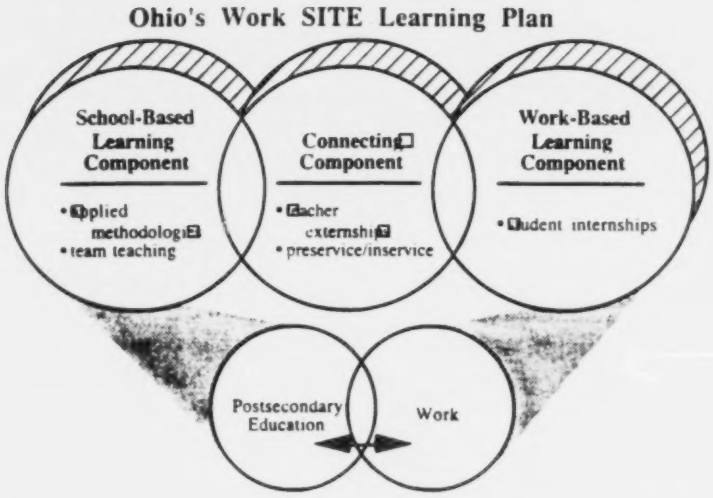
2000

"When you reach for the stars, you may not quite get one,
but you won't come up with a handful of mud either."

Leo Burnett, quoted in Communications Briefings, August 1995


Occupations:
Health Services Cluster
Medical (e.g., nurses assisting, medical assisting, home health assisting, medical laboratory assisting, practical nursing)
Dental (e.g., dental assisting, dental laboratory technology)
Optical (e.g., optical services)
Pharmaceutical (e.g., pharmacy assisting)
Applied Academics
• Applied Communications
• Applied Mathematics
• Applied Science

Work SITE Learning Model



The first Ideabook was produced in 1998 as part of the national demonstration project described below. Its intended audience was vocational and academic teachers serving students in the Industrial & Engineering Systems Career Cluster. As part of a new five-year School-to-Work Urban/Rural Opportunities Grant awarded by the U.S. Department of Labor to the Buckeye Hills Collaborative Partnership, Ideabooks are being developed for Ohio's five other career clusters: Business & Management (1999), Health Services (2000), Human Resources/Services (2001), Environmental & Agricultural Systems (2002), and Arts & Communication (2003).

Project Overview

Ohio's Work SITE Learning Model is the product of a national demonstration project for the integration of academic and vocational learning, funded by the U.S. Department of Education. The model comprises three components. Help in replicating each of these components is provided through three implementation guides developed as part of this project:

- **Connecting Component:** To help ensure that teachers are prepared to serve as a link between the workplace and the school setting, teams of academic and vocational teachers should participate in short-term worksite externships focusing on the use of academics on the job. Those wishing to create teacher externship experiences can get assistance from *Helping Teachers Connect Academics to the Workplace: An Implementation Guide for Teacher Worksite Externships.*

These guides are available from the Center on Education and Training for Employment (CETE) at The Ohio State University. The sales office is located at 1900 Kenny Road, Columbus, Ohio 43210; Phone (614) 292-4277 or (800) 848-4815, ext. 2-4277 Fax (614) 292-1260 www.cete.org/products

Other Support Resources

Worksite Mentoring Guidebook: Practical Help for Planning and Implementing QUALITY Worksite Learning Experiences

For training assistance, contact Dot Keil, 614-292-9089; or 800-848-4815, ext. 2-9089.

- **School-Based Learning Component:** Following the externship experiences, teams have a more-solid basis for developing activities for the classroom and laboratory that require the use of academics within an authentic workplace context. Vocational teachers can also collaborate with academic teachers in incorporating into applied academic classrooms the concrete, hands-on methodologies that have proved so successful with the vocational student population. Help in developing applied academic activities can also be found in *Making Connections: A Curriculum Ideabook for Teachers of Applied Academics and Industrial & Engineering Systems* and *Making Connections: A Curriculum Ideabook for Teachers of Applied Academics and Business & Management.*

- **Work-Based Learning Component:** To reinforce for students the fact that academic skills are critical to success in the workplace—and are highly valued by employers—students, too, need to spend time in the workplace, focusing on the use of academics on the job. Early in the first year of a vocational program, teachers should arrange for student worksite learning experiences (SWLEs) through which students observe how academics are used in local business and industry, health care, government, or social service agencies. *Helping Students Connect Academics to the Workplace: An Implementation Guide for Student Worksite Learning Experiences* is designed to help schools develop SWLE programs.

ACKNOWLEDGMENTS

This Ideabook is the product of many people who committed their time and talents to helping make it a useful resource for educators wishing to integrate academic and vocational/tech prep curricula.

Professional Staff:

Lois G. Harrington, Senior Program Associate/Author
Catherine C. Fitch, Consultant/Editor

Project Leaders:

Kay B. Michael, Project Director, Buckeye Hills Collaborative Partnership (BHCP)
Roberta Duncan, BHCP Career Development/Job Placement Coordinator
Barbara Reardon, BHCP Project Director, CETE
Deborah Bingham Catri, Ph.D., Senior Associate Director, CETE

Project Participants:

Buckeye Hills Career Center: Rio Grande, Ohio
Sheila W. Oehler, Chemistry, Anatomy, Physics
Phyllis E. Rose, Applied Mathematics, Algebra
Robin M. Schoonover, Patient Care Technician

Fairfield Career Center: Carroll, Ohio
Anne Clare Conner, Allied Health
Larry Friend, Applied Science/Mathematics
Shelley Kay Hurst, Applied Mathematics

Licking County JVS: Newark, Ohio
Amy J. Gibson, Applied Communications, English
Phyllis E. Randall, Applied Science
Susan L. Steinman, Dental Assisting

Muskingum-Perry Career Center: Zanesville, Ohio
Jeanie Blake, Practical Nursing
Connie M. Hilty, Applied Communications
Ken Kroah, Science/Mathematics

Pioneer Career & Technology Center; Shelby, Ohio
Beth Armstrong, Medical Technologies
Kalyn J. Stichler, Mathematics
Sandra S. Weaver, Science

Portage Lakes Career Center; Green, Ohio
Marlana A. Marquess, Applied Communications, English
Debra A. Sawhill, Diversified Health Occupations
Kathy Subity, Mathematics

Warren County Career Center; Lebanon, Ohio
David Cairns, Applied Mathematics
Loxie Kistler, Allied Health Tech Prep
Sandra R. Monti, Applied Science, Chemistry, Physics

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The Ideabook: An Introduction

This Ideabook was developed to help both vocational/tech prep and applied academics teachers plan and present their subject matter in a more integrated way. Let's start with a look at why such a book is needed.

A Curriculum Divided

The American educational system has long divided learning into its separate parts in order to simplify the teaching process. Thus, students learn English from English teachers, mathematics from mathematics teachers, science from science teachers, and vocational subjects from vocational teachers. There are in fact students who thrive in this environment, who relish the learning of abstract concepts taught in isolation. But there are many, both in vocational/tech prep and college prep programs, who do not.

> ***Scenario:** Marvetta is an underachiever. She can be relied upon to do her English homework assignments on time, but the work is clearly done at the last minute, with a minimum amount of effort expended. Yet Marvetta spends long hours working on the school newspaper. Why can't she bring that devotion and concentration to bear on her English assignments?*

Marvetta is not alone. For some students, classwork is busywork—something done for the teacher, with no relevance to the real world. They don't take it seriously. Yet when the work is real—publication of a school newspaper—their motivation and effort increase dramatically.

For some students, classwork is busywork with no relevance to the real world.

It's not just a motivational issue. Some students—again, both vocational/tech prep and college prep—do not understand concepts taught purely on a theoretical level. Until they see the concept in its application, they do not grasp it. They may memorize it for a test, but it slips and slides out of their mental database as soon as the test is over. The student studying allied health may react this way to information about subjective and objective cases of pronouns in English class. The student hoping to major in English in college may react this way to information about sine, cosine, and tangent in advanced mathematics class.

Some students do not understand concepts taught purely on a theoretical level.

If you have ever taken a foreign language, you have probably said at some point, "Well yes, I took French (or Spanish or German or whatever) for x number of years, but I don't remember much. I never had to use it, you know." We acknowledge this, yet we don't apply this knowledge in our own classes. After all, we're teaching a subject we love, and surely the students will share that love if only we can convey it with the proper skill and enthusiasm.

> *Scenario: The English teacher is covering a simple grammatical concept. Once the concept has been taught, he tests the students. The majority fail the test. So the English teacher regroups and teaches the concept using a different approach. When he next tests the students, many more pass the test. But this is a new English teacher, and he is determined that all students should pass. So he keeps trying. Finally all students pass a test on the concept. The English teacher is thrilled ... until he discovers that few of the students apply the concept correctly in their writing or speaking. They only apply it on tests covering the concept in isolation.*

This is another flaw in a system in which knowledge is broken down into separate parts. If students treat grammar lessons as separate—and unrelated to speaking and writing—in English classes, imagine what happens to that knowledge when they walk across the hall to mathematics or science or history class. Clearly, in their minds, grammar is not relevant to those classes.

Integrating the Curriculum

How do you solve the problem of the fragmented curriculum? Since there is no sign that classes will cease to be divided in this way in most schools in the near future—or ever—what can be done?

If you are an applied academics teacher—

- First, ensure that concepts are taught in an applied, hands-on fashion.
- Second, ensure that classroom activities reflect the real world. Require students to draw on what they have learned in many different classes in order to solve complex problems.

If you are a vocational teacher—

- Foster respect for—and systematically reinforce—the academic skills students will need to succeed in the world of work.

Why Should You Use This Approach?

When the emphasis in the classroom is on hands-on application and solving of real-world problems, the instructional methodology switches from one that is teacher-centered (lectures, demonstrations) to one in which students are highly active and involved—a prerequisite to learning. When you have the sole responsibility for action in the classroom, ***your*** teaching may or may not result in ***student*** learning. But when students share actively in the action, they are bound to discover and grow and learn.

When students share actively in the action, they are bound to discover and grow and learn.

An approach that increases student learning and retention is ***critical*** given today's world of work. (And most students—not just those in vocational education—will end up in that world sooner or later.)

What does the work world demand these days?

- The world of work demands teamwork—yet we primarily require individual effort in the classroom.
- It demands problem-solving and thinking skills—yet we primarily focus on mastery of individual concepts as measured on objective tests (true-false, completion, multiple-choice, matching).
- It demands lifelong learning skills, since information and technology now change so rapidly—yet we plan our courses as if we had to teach students everything they need to know for a lifetime.

The competencies and foundation skills and qualities required for the work world were identified and defined by the Secretary's Commission on Achieving Necessary Skills (SCANS) in 1991. These are presented at the end of this section, pp. 8–14.

SCANS/2000
The Workforce Skills Website
<http://intinia.wpmc.jhu.edu>

How This Ideabook Can Help You

This Ideabook is designed to help you modify your instructional program to more closely match the demands and realities of the real world. Its core content was developed as part of an earlier project on academic-vocational integration that began with an extensive survey of what teachers in Ohio are doing to integrate academic and vocational instruction. It began, in short, with a detailed picture of ***reality***:

- We know, for example, that you may be a new teacher with a major in mathematics who thought you'd be teaching college prep mathematics and found yourself instead teaching something called ***applied mathematics*** to students in health services—this despite the fact that you have little medical knowledge. Worse, you're in a totally separate building from the health services teachers and rarely, if ever, have the opportunity to talk with them, let alone plan jointly. Furthermore, the other mathematics teachers in your department make it very clear that they feel your applied mathematics courses are not "real math."
- Or, you may be an ***applied science*** teacher who worked very hard for two years with your vocational counterpart to develop activities relevant to your students, who were all in electronics programs. You have just gotten your assignment for next year and have discovered that the students in your applied classes will all be students in health services programs.
- Or, you may be an ***applied communications*** teacher who is being told by the vocational department that you must focus strictly on the communications competencies needed for the occupational area. Yet your English department chair says that you must focus strictly on the English competencies identified by the State as essential for that grade level. So, do you teach Shakespeare or the skills needed to read job specs?

- Or, you may be a ***vocational*** or ***tech prep*** teacher who has always done a good job teaching occupational skills and the academic and employability skills related to them. You've always been happy working within your department and don't see any reason to get involved with those academic teachers who, in your opinion, don't understand the occupation or the real world of work at all.

The situations around the state vary greatly. For every worst-case scenario, there is its opposite. There are supportive administrators, vocational and academic teachers working in tandem, and schedules and facilities supporting integration. The point is this: Regardless of your situation, there is a step you can take to move further along the road to integration.

Regardless of your situation, there is a step you can take to move further along the road to integration.

The ideal is ***fully integrated academic and vocational instruction***—for one very good reason: it provides students with a better education and prepares them more effectively to enter and succeed in the world of work.

- When teachers work as teams, they are modeling teamwork.
- When teaching teams—made up of teachers with different specialties—pool their strengths to reach their goals, that reflects the reality of the world of work.
- When students are required to apply all the skills they learn—in an orchestrated manner—in order to solve real problems, they are learning how to function in the workplace of today and tomorrow.

However, if the ideal and your own situation seem worlds apart, you need not throw your hands up in despair. The old cliché holds true: Rome was not built in a day. You can improve your situation, one step at a time:

- Look at the ideas in this book.
- Immediately try those that are within your power.
- For the rest, think about what you'd like your "classroom" to look like, in terms of integration, in five years.
- Determine the steps you will take and the support you will need to get there.
- Then get started—step by step.

What Work Requires of Schools: A SCANS Report for America 2000 (Washington, DC: Secretary's Commission on Achieving Necessary Skills, U.S. Department of Labor, June 1991), pp. B-1, B-2, C-2, C-3.

SCANS Competencies

Resources

Allocates Time

- Selects relevant, goal-related activities.
- Ranks activities in order of importance.
- Allocates time to activities.
- Understands, prepares, and follows schedules.

Allocates Money

- Uses or prepares budgets, including making cost and revenue forecasts.
- Keeps detailed records to track budget performance.
- Makes appropriate adjustments.

Allocates Material and Facility Resources

- Acquires, stores, and distributes materials, supplies, parts, equipment, space, or final products in order to make the best use of them.

Allocates Human Resources

- Assesses knowledge and skills and distributes work accordingly.
- Evaluates performance, and provides feedback.

Interpersonal

Participates as a Member of a Team

- Works cooperatively with others and contributes to the group with ideas, suggestions, and effort.

Teaches Others

- Helps others learn.

Serves Clients/Customers

- Works and communicates with clients and customers to satisfy their expectations.

Exercises Leadership

- Communicates thoughts, feelings, and ideas to justify a position.
- Encourages, persuades, convinces, or otherwise motivates an individual or groups, including **responsibly** challenging existing procedures, policies, or authority.

Negotiates

- Works toward an agreement that may involve exchanging specific resources or resolving divergent interests.

Works with Cultural Diversity

- Works well with men and women and with a variety of ethnic, social, or educational backgrounds.

Information

Acquires and Evaluates Information

- Identifies the need for data.
- Obtains data from existing sources or creates needed data.
- Evaluates the relevance and accuracy of the data.

Organizes and Maintains Information

- Organizes, processes, and maintains written or computerized records and other forms of information in a systematic fashion.

Interprets and Communicates Information

- Selects and analyzes information.
- Communicates the results to others using oral, written, graphic, pictorial, or multimedia methods.

Uses Computers to Process Information

- Employs computers to acquire, organize, analyze, and communicate information.

Systems

Understands Systems

- Knows how social, organizational, and technological systems work and operates effectively within them.

Monitors and Corrects Performance

- Distinguishes trends.
- Predicts impact of actions on system operations.
- Diagnoses deviations in the function of a system/ organization.
- Takes necessary action to correct performance.

Improves and Designs Systems

- Makes suggestions to modify existing systems to improve products or services.
- Develops new or alternative systems.

Technology

Selects Technology

- Judges which set of procedures, tools, or machines, including computers and their programs, will produce the desired results.

Applies Technology to Task

- Understands the overall intent and the proper procedures for setting up and operating machines, including computers and their programming systems.

Maintains and Troubleshoots Technology

- Prevents, identifies, or solves problems in machines, computers, and other technologies.

SCANS Foundation Skills and Qualities

Basic Skills

Reading

- Locates, understands, and interprets written information in prose and documents—including manuals, graphs, and schedules—to perform tasks.
- Learns from text by determining the main idea or essential message.
- Identifies relevant details, facts, and specifications.
- Infers or locates the meaning of unknown or technical vocabulary.
- Judges the accuracy, appropriateness, style, and plausibility of reports, proposals, or theories of other writers.

Writing

- Communicates thoughts, ideas, information, and messages in writing.
- Records information completely and accurately.
- Composes and creates documents such as letters, directions, manuals, reports, proposals, graphs, and flow charts.
- Uses language, style, organization, and format appropriate to the subject matter, purpose, and audience.
- Includes supporting documentation and attends to level of detail.
- Checks, edits, and revises for correct information, appropriate emphasis, form, grammar, spelling, and punctuation.

Arithmetic

- Performs basic computations.
- Uses basic numerical concepts such as whole numbers and percentages in practical situations.
- Makes reasonable estimates of arithmetic results without a calculator.
- Uses tables, graphs, diagrams, and charts to obtain or convey quantitative information.

Mathematics

- Approaches practical problems by choosing appropriately from a variety of mathematical techniques.
- Uses quantitative data to construct logical explanations for real-world situations.
- Expresses mathematical ideas and concepts orally and in writing.
- Understands the role of chance in the occurrence and prediction of events.

Listening

- Receives, attends to, interprets, and responds to verbal messages and other cues such as body language in ways that are appropriate to the purpose: for example, to comprehend, to learn, to critically evaluate, to appreciate, or to support the speaker.

Speaking

- Organizes ideas and communicates oral messages appropriate to listeners and situations.
- Participates in conversation, discussion, and group presentations.
- Selects an appropriate medium for conveying a message.
- Uses verbal language and other cues such as body language appropriate in style, tone, and level of complexity to the audience and the occasion.
- Speaks clearly and communicates a message.
- Understands and responds to listener feedback.
- Asks questions when needed.

Thinking Skills

Creative Thinking

- Uses imagination freely.
- Combines ideas or information in new ways.
- Makes connections between seemingly unrelated ideas.
- Reshapes goals in ways that reveal new possibilities.

Decision Making

- Specifies goals and constraints.
- Generates alternatives.
- Considers risks.
- Evaluates alternatives.
- Chooses best alternatives.

Problem Solving

- Recognizes that a problem exists (i.e., there is a discrepancy between what is and what should or could be).
- Identifies possible reasons for the discrepancy.
- Devises and implements a plan of action to resolve discrepancy.
- Evaluates and monitors progress.
- Revises plans as indicated by findings.

Seeing Things in the Mind's Eye

- Organizes and processes symbols, pictures, graphs, objects, or other information.
- For example, sees a building from a blueprint, a system's operation from schematics, the flow of work activities from narrative descriptions, or the taste of food from reading a recipe.

Knowing How to Learn

- Recognizes and can use learning techniques to apply and adapt new knowledge and skills in both familiar and changing situations.
- For example, is aware of learning tools such as personal learning styles (visual, aural, etc.); formal learning strategies (notetaking or clustering items that share some characteristics); and informal learning strategies (awareness of unidentified false assumptions that may lead to faulty conclusions).

Reasoning

- Discovers a rule or principle underlying the relationships between two or more objects and applies it in solving a problem.

- For example, uses logic to draw conclusions from available information, extracts rules or principles from a set of objects or written text, applies rules and principles to a new situation, or determines which conclusions are correct when given a set of facts and a set of conclusions.

Personal Qualities

Responsibility

- Exerts a high level of effort and perseverance toward goal attainment.
- Works hard to become excellent at doing tasks by setting high standards, paying attention to details, working well, and displaying a high level of concentration even when assigned an unpleasant task.
- Displays high standards of attendance, punctuality, enthusiasm, vitality, and optimism in approaching and completing tasks.

Self-Esteem

- Believes in own self-worth and maintains a positive view of self.
- Demonstrates knowledge of own skills and abilities.
- Is aware of impact on others.
- Knows own emotional capacity and needs and how to address them.

Sociability

- Demonstrates understanding, friendliness, adaptability, empathy, and politeness in new and ongoing group settings.
- Asserts self in familiar and unfamiliar social situations.
- Relates well to others; responds appropriately as the situation requires.
- Takes an interest in what others say and do.

Professional Development Plans (PDPs) available through SkillsUSA-VICA help a lot in developing these "Personal Qualities," as does student participation in the Outstanding Chapter Contest.

Beth Armstrong
Medical Technologies
Pioneer Career & Technology Center

Insert the
"About
Vocational-Academic
Integration"
Tab Here

About Vocational-Academic Integration

Words have an amazing power to distract. If you were to read a great many books and articles about the blending of academic and vocational subjects these days, you would see many different terms—*applied academics* and *vocational-academic integration* and *interdisciplinary instruction* and *correlated instruction*—and many different definitions of those terms. It's easy to get caught up in debating terms and to divert your attention from what is most important: improving instruction for students.

The Integration Continuum

For the purposes of this document, let's consider a model that is a continuum. The continuum does ***not*** differentiate between good and bad instruction. Rather, it differentiates, in degrees, between good traditional instruction that serves some students well ***and*** increasingly more integrated instruction that serves most students more effectively.

The integration continuum differentiates, in degrees, between good traditional instruction that serves some students well and increasingly more integrated instruction that serves most students more effectively.

- In the stereotypical ***traditional model***, we find each individual teacher working alone in the classroom, teaching only his or her assigned subject in isolation. If the teacher is enthusiastic, knowledgeable, and creative, some students will thrive in this environment.
- At the ***lowest level of the integrated model***, we find those same individual teachers working alone but trying very hard to relate the subject matter to the real world of life and work. They also try to incorporate hands-on activities requiring students to apply what they have learned.
- The ***next level*** moves those teachers out of isolation into varying levels of cooperation and collaboration:
  - ✓ Planning occasional joint activities
  - ✓ Utilizing team teaching
  - ✓ Aligning curricula
- The ***top level*** involves total interdisciplinary teaming in which teachers and instruction are no longer isolated. Instead, they all are focusing their efforts on a major project or theme.

In recent years, researchers have been looking at various models of integration. Two notable efforts have been spearheaded by the National Center for Research in Vocational Education (NCRVE) at Berkeley and the Southern Regional Education Board (SREB). The publications from both NCRVE and SREB (see reference list at the end of this section) are full of exciting examples of what happens in schools that adopt—and truly support—an integrated model.

NCRVE Models

Most of the NCRVE publications on integration focus on eight models:

1. Vocational Teachers Introduce Academic Competencies into Vocational Courses
2. Vocational and Academic Teachers Collaborate to Enhance Academic Competencies in Vocational Classes
3. Academic Teachers Enhance the Vocational Relevance of the Academic Curriculum
4. Curriculum in Both Vocational and Academic Courses Is Modified and Aligned
5. Senior Projects (seniors replace electives with a project)
6. The Academy Model (school-within-a-school)
7. Occupational High Schools and Magnet Schools (in which all teachers—academic and vocational—are assigned to the same facility to facilitate collaboration and course alignment)
8. Occupational Clusters, Career Paths, and Occupational Majors (in which all teachers—vocational and academic—belong to occupational clusters rather than, or in addition to, conventional departments)

SREB Model

The SREB model is in the form of case studies of successful practices derived from a program called *High Schools That Work*. This program was established by the SREB–State Vocational Education Consortium, a partnership of states, school systems, and school sites (970 sites in 22 states at the time of this writing). According to the High Schools That Work Homepage on the Internet, the program is based on the belief that students in general and vocational programs of study can master complex academic and technical concepts if schools create an environment that encourages students to make the effort to succeed.

High Schools That Work Website
<http://www.sreb.org/Programs/hstw/high.html>

The High Schools That Work program has three major goals:

- To raise the mathematics, science, communication, problem-solving, and technical achievement of more students to the national average and above.
- To blend the essential content of traditional college-preparatory studies—mathematics, science, and language arts—with quality vocational and technical studies by creating conditions that support school leaders, teachers, and counselors in carrying out ***key practices*** (see next page).
- To advance state and local policies and leadership initiatives necessary to sustain a continuous school-improvement effort.

High Schools That Work—Key Practices for Accelerating Student Achievement

- ***High Expectations:*** Setting higher expectations and getting more students to meet them.
- ***Vocational Studies:*** Increasing access to intellectually challenging vocational and technical studies, with a major emphasis on using high-level mathematics, science, language arts, and problem-solving skills in the modern workplace and in preparation for continued learning.
- ***Academic Studies:*** Increasing access to academic studies that teach the essential concepts from the college-preparatory curriculum by encouraging students to use academic content and skills to address real-world projects and problems.
- ***Program of Study:*** Having students complete a challenging program of study with an upgraded academic core and a major.
- ***Work-Based Learning:*** Giving students and their parents the choice of a system that integrates school-based and work-based learning. The system should span high school and postsecondary studies and should be planned by educators, employers, and employees.
- ***Teachers Working Together:*** Having an organization, structure, and schedule giving academic and vocational teachers the time to plan and deliver integrated instruction aimed at teaching high-level academic and technical content.
- ***Students Actively Engaged:*** Getting each student involved in rigorous and challenging learning.
- ***Guidance:*** Involving each student and his or her parents in a guidance and advising system that ensures the completion of an accelerated program of study with an in-depth academic or vocational-technical major.
- ***Extra Help:*** Providing a structured system of extra help to enable students who may lack adequate preparation to complete an accelerated program of study that includes high-level academic and technical content.
- ***Keeping Score:*** Using student assessment and program evaluation data to improve continuously the school climate, organization, management, curricula and instruction to advance student learning and to recognize students who meet both curriculum and performance goals.

Some Cautions

Before we look at our preferred model in greater detail, two cautions should be mentioned.

Caution One: First comes knowledge, then comes application. Students cannot bring their knowledge and problem-solving skills to bear on a problem or theme unless they have first acquired some knowledge and problem-solving skills. You cannot simply devise fun hands-on activities to keep students active and happy and expect achievement of established learning objectives to occur. Learning involves rigor. Activities must be structured to provide application of concepts that have been ***taught*** or to lead to desired ***discoveries***.

This is analogous to an issue much in the professional literature these days. There was concern in the recent past that students lacked self-esteem, so units and courses in self-esteem were developed and taught. But, asked some of the country's leaders and thinkers, how can you teach self-esteem in a vacuum, separate from achievement? Self-esteem, they say, is earned, not bestowed.

Thus it is with problem solving. To solve problems, student need first to ***work*** to learn basics. Then, and only then, can they apply those basics to the solution of problems.

Caution Two: Don't water down the content. Regardless of what you call the approach (applied academics, vocational-academic integration, etc.), the content must not be diluted. As is made very clear in SREB's key practices, all students—both vocational/tech prep and college prep—need to graduate with the skills required for whatever step comes next. Whether the next step is enrollment at two-year or four-year educational institutions, employment in existing enterprises, development of their own entrepreneurial enterprises, or some other endeavor, students need certain skills. Watered-down academics do not provide a passport to success for any of those options.

For example, if you peruse catalogs of texts from various publishers, you will find the tales of Shakespeare written using "controlled vocabulary." In other words, the basic plot line is provided using very simplified language. Is that Shakespeare? No, it is not. It's like serving a BLT—but without bacon and tomato.

Yes, you need to start instruction at a level that is realistic for students' abilities. But if Shakespeare is part of the curriculum, then the teacher's job is to design activities that will help students deal with the language as is. (Some Ohio teachers, for example, have students work in teams to translate passages using a glossary and then share the results of their efforts.) It is also the teacher's job to help them discover why Shakespeare is still relevant to their lives today.

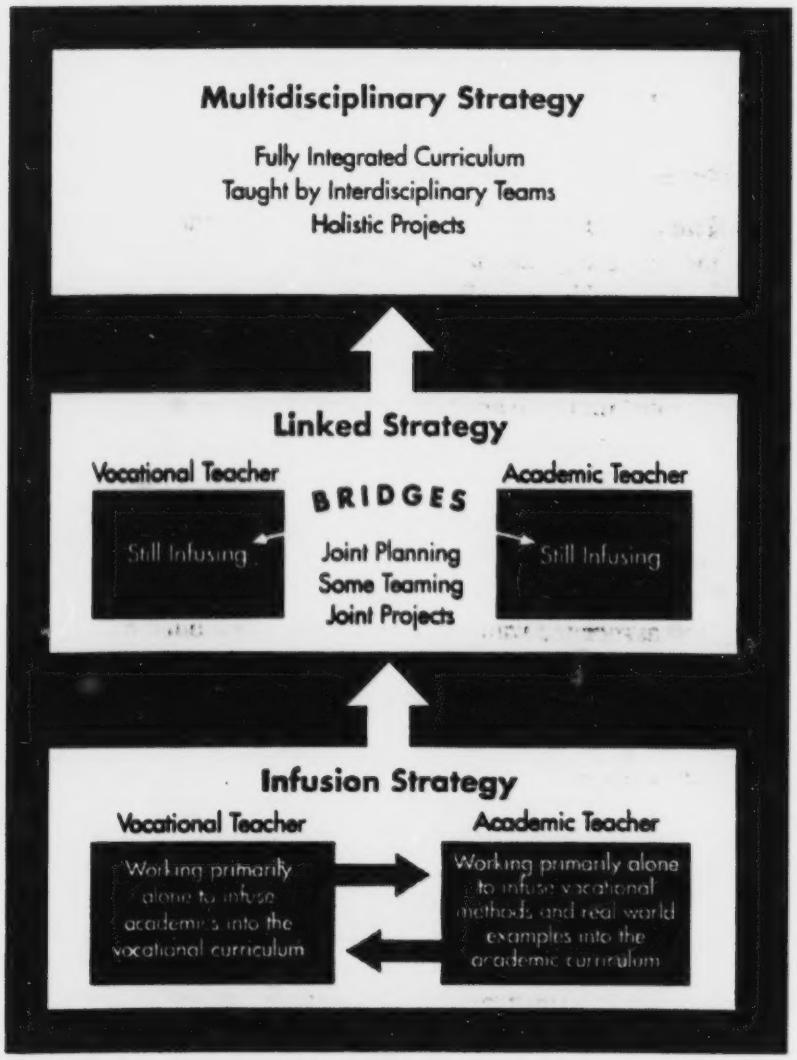
What should be different about ***applied*** academics courses is ***not*** the level of rigor and the challenge of the content. What is different is ***how*** that content is taught: (1) in a hands-on applied manner and (2) with ties to the real world (life skills, occupational content) to the extent possible. Such an approach is more effective not only with vocational/tech prep students but with many college prep students as well.

What should be different about applied academics courses is not the level of rigor and the challenge of the content, but how that content is taught.

Work SITE Tri-Level Model

A simpler model for our purposes—one consistent with the NCRVE and SREB models and particularly responsive to teachers' concerns—is found in *Integrating Curriculum*, developed by Feichtner et al. for School Restructuring Support Associates (1994). The authors describe three levels of integration: the ***infusion*** strategy, the ***linked*** strategy, and the ***multidisciplinary*** strategy.

Our model (based on the Feichtner model) is shown graphically below and described in detail in the remainder of this section.



Maximum Integration

Minimum Integration

BEST COPY AVAILABLE

If you are a vocational teacher . . .

Infusion Strategy: Applied But Separate

If you are a vocational teacher, at the Infusion level you are reinforcing the use of academics in your vocational instruction:

- You have students use the academic skills as they would on the job: orally communicating directions to another student, writing up job orders, calculating customer billings.
- You are building problem solving and decision making into classroom activities so that when students leave the program they can operate on their own, without teacher direction.
- You are relating your instruction to the real world of work and simulating that environment to the greatest extent possible.

Formulas for Success

The U.S. Department of Labor offers the following ideas for incorporating job-related elements into the at-school experience in their publication, *School-to-Work Connections: Formulas for Success* (1992, p. 13):

- Involve employers in curriculum development and evaluation to ensure that content, expectations, examples, and standards reflect actual worksite experiences.
- Create classroom lessons that reflect the demands of the workplace and convey specific on-the-job performance requirements to students.
- Group various competencies into clusters that are associated with job-specific tasks, and build manageable, interdisciplinary learning activities around the tasks.
- Emphasize demonstrations, performance modeling, and supervisor coaching as the primary means of teaching students.
- Test students in ways that measure such job-specific criteria as performance quality, production rates, safety, customer satisfaction, and manufacturer's specifications.
- Personalize instruction as much as possible. Develop individual learning contracts for training; work in and with small teams; provide support services on a basis that resembles "case management."

- Design learning tasks to reflect and reinforce work tasks. Include basic skills and employability skills in the same process.
- Structure lessons so that students *learn by doing*. Academic lessons should support work-related learning-by-doing rather than the reverse.
- Express lesson assignments as "Work Orders" reflecting those used in industry.
- Emphasize quality and productivity by applying reasonable pressure on students to perform tasks correctly and on time—as determined by industry standards.
- Encourage students to work in teams to complete learning assignments. Be sure to match experienced students with less-experienced students.
- Use actual worksite materials (manuals, installation instructions, safety materials, forms, tools, etc.) as part of routine lesson content.
- Issue supplies, tools, and equipment in a way similar to that of the worksite. Use a work-based requisition process for issuing materials.
- Organize the training area like the worksite for whatever industry you train for. Explicitly discuss the work climate.
- Whenever possible, use real products and "customer relations" between student and customer as part of learning.
- Sustain instruction patterns between instructor and student that mimic those of the worksite (supervisor and worker) in terms of formality, expectations, discipline, and responsibilities.

Bridging the Gap

Note, however, that you ***can't*** reinforce exactly what's going on ***now*** in the academic classes if you have no contact with those classes. So another thing you can do is reach out a friendly hand to the academic teachers who teach your students. For example:

- Invite them into your classroom and laboratory.
- Talk to them in the teacher's lounge.
- Sit with them at social events such as football games.
- Provide them with copies of the texts you use.
- Invite them to participate in meetings of your program's advisory committee or vocational student organization activities.
- Share with them relevant articles from the occupational journals you read.

If you have a problem with this—if you think that you know and can provide all the academics your kids need—then you may need to work on your attitude. A student with minimal mathematics, science, and communication skills will not be prepared for the ***changing*** world of work. Today's world requires lifelong learning. Students cannot, for example, learn to use one particular computer and software package and expect that exposure to serve them for a lifetime. Those who will succeed and advance on the job are those who can think and grow. To develop professionally, they need academic skills. Workplace literacy programs are thriving today for that very reason—too many workers do not have sufficient reading, writing, mathematics, and science skills to participate in the training required for using new equipment and technology.

Just as you are a specialist--an expert--so are the academic teachers. Support each other, and the sum will be greater than its parts.

Higher-level academic skills also prepare students for required life skills: participating productively as a citizen; managing home and bills and taxes; identifying and pursuing interesting hobbies and leisure activities.

Just as you are a specialist—an expert—so are the academic teachers. Support each other, and the sum will indeed be greater than its parts.

But wait! If you are an applied academics teacher, did you skip the paragraphs above that pertained to the vocational teacher because they "weren't relevant to your needs"? If so, go back and read them now. If you are a vocational teacher, don't stop reading now just because the next paragraphs are addressed to applied academics teachers. It's easy to blame the administration for all the barriers to integration (no time, separate facilities, etc.), but the ability to integrate also rests on each teacher's willingness to step outside his/her own specialty and consider the rest of the world. This is Rule #1 on the road to integration.

If you are an applied academics teacher . . .

If you are an applied academics teacher, at the Infusion level you are trying to apply your content to an occupational area about which you may know a great deal, a little, or nothing. What can you do when you don't know anything about the occupational content and you don't have easy or regular access to the vocational teacher? Actually, there are lots of things you can do.

Provide a Work-Like Setting

The ideas suggested by the U.S. Department of Labor for vocational teachers (see pp. 24-25) also apply, in a sense, to academic teachers. That is, if you want to make instruction more real and relevant, then you need to provide a work-like setting. Here's how:

- Focus less on "concocted" educational experiences, and spend more time devising active and "real" learning experiences for students.
- Provide ample opportunities for students to work in teams, as well as individually, and to "make meaning" with their academic skills.
- ***Teach*** less and focus more on making it possible for students to ***learn***.

Visit Job Sites

The "Connecting" component of Ohio's Work SITE Learning Model is a model for teacher externships. Through this component, teaching teams made up of a vocational teacher and his or her academic counterparts visit area businesses, industries, and community-based organizations to observe and discuss with employees how academics are used on the job. Such activities can help you identify relevant academic content and ways in which to tie that content to the workplace within your academic instruction.

If this option is not available to you, you may be able to find alternatives. For example, if you are teaching science to students in a dental assisting program, you may know someone who is a dentist, who would be willing to help you.

Another source for job site visits is the advisory or craft committee for the vocational program. Such committees are made up of local employers who, as their name suggests, serve in an advisory capacity for the vocational program. They may review curricula, judge contests, donate equipment, provide co-op work opportunities, serve as guest speakers, and the like. If you are willing to spend the time, members of these committees might happily provide you with a Saturday on-the-job experience.

Review the Relevant Vocational-Academic Task Lists

Vocational instruction in Ohio is structured using vocational-academic task lists. Initially, these were the Occupational Competency Analysis Profiles (OCAPs), each one covering an occupational area (e.g., nurse aide). As part of Ohio's emerging model—Career-Focused Education for Ohio's Students—Integrated Technical and Academic Competencies (ITACs) at the core, career cluster, and specialization levels are replacing the OCAPs. The differences between these two approaches are shown in the chart on the following page.

Excerpts from the Diversified Health Occupations OCAP are provided in the last section of this document.

The OCAP or ITAC document provides an important frame of reference for curriculum planning—whether vocational or academic. OCAPs and ITACs start with what students need to ***do*** on the job (competencies) and then identify the occupational and academic knowledge, skills, and attitudes needed to perform those competencies. By reviewing these documents, applied academics teachers can focus instruction—at least in part—on the ***actual tasks*** students must perform in the work world or in life (write a convincing memo, calculate the amount of materials needed to perform a particular job, solve problems on-site using knowledge of scientific principles) and then teach the English, mathematics, or science skills and concepts as they are needed in relation to the tasks.

Applied academics teachers need to focus instruction on the actual tasks students must perform in the work world or in life and then teach the academic skills and concepts as they are needed in relation to those tasks.

For example, have students complete a mileage reimbursement form from an actual job. Teach the mathematics in relation to that task. Better still, help them discover the principles themselves—help them to think mathematically, to define and answer their own questions. Bring in ethics: Would it be right to charge the company mileage for a side trip to run some errands?

An Enhanced Curriculum Model

Building From . . .	*Moving Toward . . .*
• Ohio Competency Analysis Profile (OCAP)	• Integrated Technical and Academic Competencies (ITAC)
• Competencies designed specifically for occupational programs	• Three different types of ITACs: 1. Core ITAC: Competencies addressing what all students need to know and be able to do 2. Cluster ITAC: Competencies common across occupations within a career cluster 3. Specialization ITAC: Competencies for specific occupations
• Competencies defining state standards	• Competencies directly linked to national academic, employability, and occupational standards, where they exist
• Validation by a panel of business and industry representatives	• Teacher involvement in the development of competencies; then validation by a business and industry panel
The Look of the List	
• Competencies listed independently of workplace context	• Competencies identified along with *statements of expectations* and *scenarios* to describe workplace context
• Separate lists of occupational, employability, and academic competencies	• List that integrates occupational, employability, and academic competencies
• List organized by— ✓ Units ✓ Competencies ✓ Competency Builders	• List organized by— ✓ Strands/Units ✓ Competencies ✓ Key Indicators
How the List Is Used	
• Competencies designed principally for 11th- and 12th-grade programs	• Competencies designed to be used flexibly in career-focused education
• Competencies to be used principally by vocational and applied academics teachers	• Core competencies to be used by all teachers; core, cluster, and specialization competencies to be used in career-focused education, including vocational and applied academics courses

Make Contact with Your Students' Vocational Teachers

If you have never met your occupational counterpart, take the initiative. Feedback from academic and vocational teachers indicates that there are some barriers typical to any situation involving "us" and "them." Vocational teachers who came to teaching straight from industry say that the academics look down their noses at them because they took an alternative route to certification. Academic teachers say that vocational teachers look down their noses at them because of their lack of technical know-how. On the other hand, teachers who participated in integrated teaching teams as part of the Work SITE or Buckeye Hills Collaborative Partnership (BHCP) project found it easy to work together and developed mutual respect rather quickly.

It's mostly a matter of taking that first step and turning a stranger into a friend. Be creative in your attempts to make contact. You know best what would feel comfortable for you and what the limits and possibilities of your particular situation are. Some possibilities:

- ***Let students be the messenger.*** Consider making comments in class that show respect for students' vocational instructors; such messages will likely get back to those teachers. Or, when students ask questions that cross over into occupational content, ask them to get the answer from their vocational teacher and then explain it to you during the next class session. (But don't overdo this. You want to show that you value the teacher's expertise without overburdening him or her with questions coming from your class.)
- ***Set up a shared bulletin board.*** If you share a teacher's lounge but not a common planning time, try setting up a bulletin board where you can communicate. A mathematics teacher could, for example, post a note such as the following: "About to teach formulas involving fractions. Need examples of how that would be used in health services." Or teachers could post the key concepts they're covering with each class that week in order to promote more correlation between classes.

Working together is mostly a matter of taking that first step and turning a stranger into a friend. Be creative in your attempts to make contact. A little contact can go a long way.

- *Set up meetings.* Identify times when you can meet with the vocational teacher. At the very minimum, you could arrange to visit the vocational classroom or lab occasionally during one of your planning periods. Or perhaps the two of you can pick a day when you could meet there for an hour after school to discuss your mutual students. If possible, arrange to have someone—fellow teacher, department head, curriculum specialist—cover one of your classes for a period so that you can visit the vocational class while your students are there. Similarly, invite the vocational teacher to visit your classroom when you are teaching his or her students. With the vocational teacher's permission (or at his/her invitation), attend meetings of the program's advisory or craft committee.

  A teaching team from Belmont-Harrison Career Center (St. Clairsville, Ohio) took advantage of the fact that advisory committee meetings for three programs were scheduled on the same night as Parent-Teacher Conferences when all teachers would be in attendance. Academic teachers with (unfortunately) few parents to meet with were able to attend portions of the advisory committee meetings. They explained their curricula and, in turn, got some ideas about what employers expect of workers in the area of academics. Both academic teachers and advisory committee members were pleased to have had this chance for interaction.

- *Seize the moment.* Identify a specific question you need help with, and pick up the phone. Or leave a note in the vocational teacher's school mailbox. Or send e-mail if that's an option. Don't impose, just open up the door to future communication.

Even if your schedule and location are not conducive to such activities, don't give up. A little contact can go a long way. If you can't meet very often, just getting materials from the vocational program can help you better relate your instruction to students' occupational interests.

Read Occupational Materials

Depending on your aptitudes and willingness to spend extra time, this could be a major undertaking or a casual and occasional activity. An applied science teacher, for example, who expects to be teaching health services students year after year and who is interested in biology, anatomy, physiology, etc., might choose to do some heavy reading in the area. But an applied communications teacher who works with students from different occupational programs each year and who has little interest in health sciences might take a lighter approach.

You need to be realistic about this. You were hired to be an academic specialist, not a vocational teacher, but a little effort can go a long way. It's sort of like buying a phrase book before visiting a foreign country. It's amazing how warmly you are received when you make an attempt to say simple things like ***hello*** and ***thank you*** in the native language.

Do you know what jobs students can get by training in the occupational area? Do you know what those jobs pay? If not, you should spend a little time looking at a general reference for occupational information, such as the *Occupational Outlook Handbook* or the *Dictionary of Occupational Titles* (DOT).

O*NET
<http://www.doleta.gov/programs/onet>

One useful source for information in this area is the Occupational Information Network (O*NET), a fully automated relational database available on CD ROM or diskettes (with selected products available on the Internet for downloading free of charge). O*NET is designed to replace the DOT and to provide the flexibility to capture rapidly changing job requirements now and into the 21st century. This comprehensive database identifies and describes occupations, worker skills, knowledges, abilities, and workplace requirements for jobs across the country in all sectors of the economy.

America's Career InfoNet
<http://www.acinet.org/acinet>

America's Career InfoNet—part of the America's Job Bank network—is a comprehensive source of occupational and economic information. If you want to know the fastest growing jobs in America, what they pay, and what training is required to succeed in these occupations, this Department of Labor Website is the place to go.

Ohio Career Information System (OCIS)
<http://www.ode.ohio.gov/www/sd/ocis1.html>

In Ohio, another source of this type of information is the Ohio Career Information System (OCIS), a computer-based system that allows students—and others—to look up career information, including specific college, financial aid, and occupation-specific information to aid them in making the correct choice for their future.

Vocational & Technical Education and Careers
<http://votech.miningco.com>

Medical and dental career information is also available through miningco.com's Vocational & Technical Education and Careers Website. There's conference information, timely articles, a career planning tool kit, and the opportunity to subscribe to *Votech Education*, a free e-newsletter.

One Ohio teaching team developed a plan for using tech prep inservice meetings to provide home school academic teachers with academic information relevant to one occupation. The plans called for holding separate meetings for teachers from each academic area—mathematics, English, and science. At these meetings, academic teachers would receive lists of the academic skills needed by workers in the occupation and real-world applications for those skills. Vocational teachers would be on hand at these meetings to discuss the tasks and answer any questions.

Draw on Your Students' Developing Expertise

This may be the most effective strategy you have at your disposal because it not only provides you with the occupational content you need but it also involves students actively, helps them process what they know, and develops their self-esteem. Too often teachers—particularly new teachers—are afraid to let students know there's anything they don't know. They're afraid that if they let down their guard and admit their ignorance, students will not respect them.

But in the workplace, it is important to know when to consult others who have expertise you lack. Bluffing on the job can be dangerous. As a teacher, you can model an important workplace skill if you sometimes step into the role of learner and let students teach you about their occupational skills. Not only will you not lose their respect, on the contrary, students will likely respect your cleverness in recognizing how clever they are. Furthermore, you will be modeling the necessity of lifelong learning. Everyone is sometimes a teacher and sometimes a learner in this world—except in America's traditional classrooms.

Everyone is sometimes a teacher and sometimes a learner.

There are many ways to use student expertise as a resource. For example:

- ***Workplace scenarios.*** The Ideas section of this document provides a number of activities in which students develop workplace scenarios that can form the basis for a variety of classroom activities.
- ***Student presentations.*** Instead of having students in applied communications classes make the typical oral presentations on "What I did on my summer vacation," consider having them do presentations or demonstrations on skills they've learned in their vocational classes. To ensure that students stay engaged while others present (good practice for the listening skills needed on the job), have them complete evaluation forms, rating the presenter's performance against established criteria.

  Such presentations will teach you a lot about the occupation your students are studying, and they will teach students how to communicate effectively. Their assignment is to explain an occupational concept or demonstrate an occupational skill so that you—an occupational "illiterate"—can understand. If at the end you still don't understand, they have not communicated effectively.

  Is this a waste of their time? Certainly not. Being able to explain a task clearly to a coworker is a skill they will likely need on the job. Furthermore, studies have shown that when students tutor others, it is the ***one doing the tutoring*** who benefits most. In order to teach someone else, you need to organize your own knowledge, which strengthens your understanding and cements the knowledge more firmly in your mental database.

- *Student discussions.* When you start a unit on a particular concept, start with student discussion. In a mathematics or science class, for example, begin the unit by asking what students already know about the concept to be addressed? Where have they encountered it in their vocational classes or outside of school? If the concept sounds foreign to them, you may need to prompt them to discover relevant examples. Then use the examples—perhaps full-blown student-developed scenarios—as the foundation for instruction. Or give students assignments to complete in the vocational lab (e.g., measure your pulse rate three times—once normal, once after running, and once after a 2-minute rest—and bring the numbers to class tomorrow so we can calculate percent of increase and decrease).

Using the expertise of students may be particularly helpful for the academic teacher who has students from many vocational areas in a single class. Correlation is more difficult when there are multiple areas to deal with, and it is unlikely that the academic teacher will be able to develop expertise across all areas. Students in this situation can also profit from the expertise of their peers. For example, the health services student who sees a demonstration by an auto mechanics student on how to change the oil in a car can use that knowledge, if only to talk to his or her mechanic more intelligently.

A teaching team from EHOVE Career Center (Milan, Ohio) used teacher exchanges to increase the applied academic teacher's knowledge of one occupational area—with students serving as the "experts" in the vocational lab. As originally planned, the applied academics teacher would exchange positions with the vocational teacher for one class period per week over an 8- to 10-week time span. The administrator was concerned about whether students would be learning in both classes if this were to occur—a valid concern.

To ensure that students were in fact in good hands, the following approach was used:

- Students were given specific lab assignments by the lab instructor—assignments involving skills they had already performed safely and satisfactorily under the supervision of the vocational instructor.

- The two instructors met in the lab to discuss lab policies and procedures. The vocational teacher pointed out areas where problems could occur and how to prevent or handle them. They also met for 15-20 minutes before each exchange to discuss specific concepts that might be observed in the lab.
- The applied academics teacher observed student performance, while ensuring that all lab policies and procedures—particularly those related to safety—were followed. The teacher also ensured that relevant academic skills were applied and reinforced.
- The vocational students taught the applied academics instructor about the occupational procedures and techniques they were using. This reinforced for the students some concepts from the applied classes and enhanced their self-image and their ability to communicate.
- In this particular case, the vocational lab included seniors in the program, while the academic class consisted entirely of juniors in the program. Thus, the vocational teacher used the academic class time to teach occupational skills involving application of specific academic skills. Had the academic class been made up of students from many vocational programs, however, the vocational teacher could have focused on demonstrating how academic skills and content previously covered in the class could be applied in occupational contexts.

The team has the following recommendations for improving this activity in the future:

- Plan the exchanges when students have already started on projects in the vocational lab—after the vocational instructor has had time to work with them a bit and answer any questions they may have.
- Allow a minimum of 5 days for exchanges, but an exchange over 10-15 days is preferable. And follow a continuous daily schedule, rather than exchanging classes one day a week for 5 weeks. These practices would make it easier to identify the logical progression and continuity of the concepts being observed.

Linked Strategy: Collaboration and Cooperation

Collaboration begins with attitude.

One Ohio applied mathematics teacher—who teaches horticulture students in collaboration with their other teachers—suggests that a key to his success is that he thinks and talks in terms of "my horticulture class," not "my juniors now in mathematics class." True collaboration begins with this kind of mindset. Students in a vocational program have, in essence, selected a major. Regardless of which class they are in, they are health services students. When the applied academics teacher operates from that viewpoint as well, students are more likely to feel that the teacher has a genuine desire to teach them (i.e., wouldn't rather be off teaching "real" academics to college prep students). This perception, in turn, may help students to accept academics as relevant.

Joint Planning

We plan instruction so that when I am teaching dental radiography, the math teacher is reinforcing geometric concepts/theories related to exposing X rays, and the science teacher is covering the physics of radiation.

Susan Steinman
Dental Assisting
Licking County JVS

At the Linked level, vocational and academic teachers work together. This may mean that an applied communications teacher meets periodically with the vocational teacher to plan jointly. Joint planning might also involve the vocational teacher and ***all*** applied academics teachers—mathematics, science, and communications. Such planning can help ensure that their instruction dovetails in a general way (see sample, p. 112) and that each teacher reinforces what the other has taught. As part of joint planning, the vocational teacher can identify occupational materials and authentic materials from the job that can be used in academic classes.

A teaching team from Pioneer CTC (Shelby, Ohio) developed a plan for securing some common planning time. They were eager to plan jointly, but the schedule just did not allow for that to happen. In looking at options, they wondered whether they could use inservice time for planning. (The district requires teachers to obtain 12 hours of professional development outside school hours.) They spent time building a case for this plan, focusing on the benefits to students if teachers coordinated their curricula and had time to develop a team feeling. As they planned, they became more and more enthusiastic, and all kinds of possibilities came to mind. When they presented their idea to their supervisor, he shared their enthusiasm. The team was

pleased that their idea was so well received, and they began to make plans for implementing their idea during the next school year.

Like the Pioneer CTC teaching team, a team from Springfield-Clark County JVS (Springfield, Ohio) presented their associate director with plans they had developed for securing common planning time. They presented a number of options (e.g., paid extended time in summer or extended day, one day a month of coordination time, shortened instructional periods). However, at that time, using their periodic professional days for joint activities was the only realistic option. They proposed using these days in two ways: (1) all three teachers secure a professional day and use it to develop joint plans and coordinate instruction; and (2) one teacher secures a professional day and uses it to be part of his/her counterpart's classes for the day (e.g., the applied mathematics teacher spends the day in the practical nursing classes). The team was allotted two professional days initially for the development of joint plans.

A Belmont-Harrison JVSD teaching team sought and received permission to lead an inservice activity in which academic-vocational teams would have the chance to develop short, integrated lesson plans.

Joint Texts

The teaching team from Pioneer wanted to underscore for students that their classes were indeed interrelated by providing them with a single text for use in their medical technologies, applied mathematics, and applied science (anatomy/physiology) classes. The team's goal was to acquire, organize, and combine all needed materials for each specific topic (e.g., respiratory therapy) that would be presented to the students. Materials would include selected information and illustrations from different sources (textbooks, journals, professional literature, medical equipment manufacturers, licensing agencies, etc.), as well as teacher-developed worksheets, fact sheets, activity pages, and coloring pages. The team selected those pages or chapters or units that were most applicable to the specific course and to the capabilities of the students.

Pioneer Career & Technology Center Teaching Team

Beth Armstrong, Medical Technologies

Kalyn Stichler, Mathematics

Sandra Weaver, Science

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To obtain a CAP-PAK Order Form from CAPCO—

Phone: 405-236-2777 or 800-364-0010

Fax: 405-236-0004 or 800-364-0500

The company they worked with, CAPCO, provided them with a self-explanatory order form for detailing the material they wanted to include in their text. They could pick not only the content but the paper, cover, and type of binding desired. The company also provided advice in ways of keeping down the costs. The team got help from their local technical college bookstore in compiling the "master" and completing the order.

You can use materials from any book: copyrighted, noncopyrighted, out-of-print. CAPCO can identify and secure any needed copyright permissions and will pay any copyright fees and factor these fees into your final costs. The teaching team felt that the estimated costs for what they desired were quite reasonable, and when they considered the usual costs of purchasing several whole books to do the job (and then not covering all the material), this process seemed to be even more cost-effective. Furthermore, the "text" can be revised and updated fairly easily each year and will improve as the instructors identify new textual materials and equipment.

Buckeye Hills Career Center Teaching Team

Sheila Oehler, Chemistry, Anatomy, Physics

Phyllis Rose, Applied Mathematics, Algebra

Robin Schoonover, Patient Care Technician

The teaching team from Buckeye Hills began work on compiling a resource notebook of authentic materials from the health area that could be duplicated and used by the academic teachers in planning instruction. They identified different health care areas and visited selected agencies/offices to obtain the materials, including:

- Input/output forms
- Medication record forms
- Incident record forms
- Charts (e.g., growth charts)
- Informational pamphlets (e.g., on disease and disease prevention)
- Abbreviation lists
- Scheduling forms
- Application forms

Before duplicating the forms, they masked the agency/office name to make the materials more generic. The team plans to prepare an introduction for the resource notebook, explaining the desired goal for the materials and how they can be used.

They also plan to prepare an evaluation form that can be used to provide the developers with feedback on how useful the notebook was so they can determine whether to continue to provide updated copies from year to year and, if so, how the content can be improved.

Joint Projects

Plans may also involve student activities or projects that are guided and graded by both the academic and vocational teachers. For example, students could work with the vocational teacher to pick a topic to research. The applied communications teacher could then work with students on the skills needed to conduct the research and develop a report (library skills, notetaking, outlining, bibliographical form, etc.). Mathematics and science teachers could serve as advisors when an aspect of the research touches on those areas. Once completed, the reports could be graded by both the applied communications teacher (for its adherence to the criteria for a good research report) and by the vocational teacher (for its technical accuracy and worth).

For example, a joint project in dental assisting could focus on patient education—specifically, on making dental hygiene presentations. Preventive measures are an important part of dental health. Dental assistants must be knowledgeable about dental diseases such as dental caries (decay) and periodontal (gum) disease in order to be able to teach patients how to prevent these conditions that can lead to eventual tooth loss. They must also be able to interact with patients of all ages and able to motivate them to practice good oral hygiene in the home.

The teaching team from Licking County JVS carried out this project in the following way:

- **Applied Science:** Students completed a unit on microbiology and the role that microbes play in causing dental diseases. They also learned about the role that proper nutrition plays in the development of healthy teeth, bones, and gum tissue.

Licking County JVS
Teaching Team

Susan Steinman,
Dental Assisting

Phyllis Randall,
Applied Science

Amy Gibson,
Technical Communications

- **Dental Assisting:** In related class, students completed an extensive unit on preventive dentistry and measures that can be taken to prevent dental diseases. They learned proper methods of brushing, flossing, and using other interdental cleaning devices. They also learned how to adapt these methods to different age groups (i.e., children, teens, adults).

  In the lab, students constructed models of the dental arches in plaster and painted them to produce an attractive teaching aid that could be used in making presentations to adults and children.
- **Technical Communications:** Students learned how to make effective oral presentations and conduct effective demonstrations. They then planned presentations/ demonstrations for children on oral hygiene, including development of visuals, learning activities, and educational games.
- **Dental Assisting:** Students practiced their presentations/ demonstrations by presenting them to each other.
- **Patient Education:** Students made presentations at several local elementary schools and day care centers during Children's Dental Health Month, and three Head Start groups visited the school's dental lab for presentations and a tour of the dental operatories. Working with small groups, students gave 40-minute presentations consisting of a short video, individual toothbrushing and flossing demonstrations, a nutritional coloring activity, and three games designed to reinforce good dental health tips.

The children enjoyed these activities and received prizes for participating. Both the children and the dental assisting students benefited from the activities.

One problem some teams have to deal with in trying to carry out major projects crossing all disciplines is that students at the school take, for example, science only in their junior year, and communications only in their senior year. One solution is to have students maintain a project notebook in which they keep track of the necessary forms, diagrams, notes, and examples for continuity and clarity over the two years of study.

Team Teaching

Collaboration and cooperation may also move beyond mere planning into team teaching. Teaming can take many forms. Teachers may team teach only occasionally, perhaps to introduce a particular unit. Or, if the school structure allows, they may spend a great deal of time in each other's classes and labs. Ohio teachers who have done this are enthusiastic in describing the difference this makes for students—in terms of both learning and attitude. The advantages are numerous:

- Having more than one teacher available allows more individual attention to be given to students.
- When teachers who share the same students function as a unified team, there tend to be fewer discipline problems.
- Teaming models and strongly underscores the relationship between academic and vocational skills. As mathematics or science concepts surface in the lab, the academic teacher is there to help.
- The applied teacher becomes more occupationally literate and gathers examples with which to illustrate concepts in academic classes.

The teaching team from Fairfield Career Center offers the following tips that they found useful when they began teaming:

- Introduce your staff as a team; talk as a team.
- Enter each other's rooms.
- When little or no coordination time is available, it is easier to communicate if you can arrange for your classrooms to be close together.
- Enforce common discipline standards.
- Communicate anytime you see another team member (the whole team does not need to be there).
- Compromise!
- Patience!

Fairfield Career Center Teaching Team

Anne Conner, Allied Health

Larry Friend, Applied Science/Mathematics

Shelley Hurst, Applied Mathematics

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Building of Administrative Support

Clearly, time and location are key aspects of collaboration. A mutual planning period is a must. Block schedules that give teachers flexibility can make an enormous difference. Assume, for example, that science and patient care technician classes are scheduled back to back in the same area of the building, and that each teacher is free during at least part of the other class. Imagine the possibilities! The teachers could serve as "aides" in each other's class. Or they could plan to extend a science lesson into the patient care technician period, or vice versa, when a particular instructional piece warrants it.

Hint: Approaching an administrator with ideas for overcoming the problems with his/her school is likely to prompt a defensive reaction. It's usually best to focus on how your recommended changes will benefit the school and the students in specific and tangible ways.

If you have trouble moving to the Linked level because of lack of administrative support, a helpful resource is *Integrating Academic and Vocational Education: Guidelines for Secondary School Principals* by Schmidt et al. (Berkeley, CA: NCRVE, 1992). Giving your principal a copy or using it to prepare a presentation for that principal could make a difference. The document presents a wealth of good information in a short, punchy style. One section spells out the barriers to integration and—even more important—suggests reasonable strategies for pulling down those barriers. The various chapters walk the administrator through the steps to integration clearly and simply.

Teaching teams involved in Ideabook development who sought support for common planning time (as described earlier) reported a very real benefit. Even though they were unable, on short notice, to secure regular, formal common planning periods, they did find administrative support. Administrators were impressed with the teacher collaboration shown, the plans made, the enthusiasm of the teachers, and their focus on the benefits to students. Teachers, in turn, found out the constraints facing the administrators (e.g., how truly complicated the scheduling process is). A foundation was established for increasing options for common planning in the future.

The team from EHOVE Career Center that secured administrative approval for teacher exchanges suggests that it is important to know the "style" of your administrators. Will they be more receptive to a formal written plan, or to an informal face-to-face meeting? How receptive are they to change? If they are not quick to accept changes, consider starting small.

Building of Faculty Support

Fellow teachers may be more motivated to link and team, collaborate and coordinate if they see that your team is enthusiastic and successful, so share your achievements. The teaching team from Portage Lakes explains their attempt to build faculty support as follows:

> We made an inservice presentation at our May staff meeting regarding our work on curriculum integration and our findings. The bottom line was good communication and how we can work with each other to complete projects that all classes can benefit from. Sometimes we each get bogged down in our own agendas and courses of study and forget that, with the power of mutual cooperation and joint lessons, we can achieve on a greater scale. Ultimately, the students receive the greatest benefit when they see the practical application of theories. Our staff applauded our efforts as they saw firsthand the fun and the effectiveness of our integrated projects.

Portage Lakes Career Center Teaching Team

Marlana Marquess, Applied Communications, English

Debra Sawhill, Diversified Health Occupations

Kathy Subity, Mathematics

Multidisciplinary Strategy: Fully Integrated Curriculum

The Multidisciplinary level is where the academic-vocational walls come down, both literally and metaphorically. Through a school-within-a-school or cluster structure, students are assigned to an occupational program taught by a team of teachers—academic and vocational—working together to provide instruction. The academic teacher no longer reports to a department chair in his/her academic area; the vocational teacher no longer reports to a vocational supervisor for his/her area. Instead, a team leader is selected on the basis of leadership skills, and that person's specialty may be vocational or academic. In some integration models at this level, students stay with the same team of teachers for the two or three years of the program.

Schoolwide Projects

In some schools, projects provide the focus for all instruction. At Rindge School of Technical Arts in Cambridge, Massachusetts, for example, all ninth graders are involved in a project called *CityWorks* in which the "text" is the city itself. Students spend a portion of each school day carrying out projects related to the city with the coaching of their teachers. In this case, the walls have come down not only between disciplines but also between the school and the community. Tenth graders at Rindge focus on constructing electrical vehicles, and all instruction supports successful completion of that task.

Projects can cross the lines between occupational areas. When a school focuses on a major project, students in different areas can each bring their growing expertise to bear on its completion. Imagine, for example, a school project to turn a vacant lot into a city park. Students in social studies or communications classes could devise surveys to determine what the citizenry would desire in such a park. Students in health services could research the types of accidents and injuries that typically occur in park settings and what can be done during the design and development stages to minimize their occurrence. Students in marketing classes could develop a publicity campaign for the effort. Students in horticulture classes could design and develop the landscaping. And on and on and on. Just as in real life, there would be a role for most specialties in any complex project. And just as in real life, those roles interact.

> Three-quarters of the students who train in a particular field never work in that field for a single day once they leave school. And the average American changes jobs seven times in a lifetime. Narrow, job-specific training for entry-level jobs is an anomaly. Broad, industry-wide training is what is needed. . . . Vocational education's greatest strength is not putting kids in jobs, it's its methods.
>
> Larry Rosenstock, Executive Director
> Rindge School of Technical Arts

If this sounds exciting to you, you may wish to check out one or both of the following publications: *The VIA Book: A Best Practices Manual from the Vocational Integration with Academics Project at the Rindge School of Technical Arts* and *The New Urban High School: A Practitioner's Guide.* These highly readable books are full of interesting and useful information, as well as vivid examples of integrated problem- and project-based learning at its best. The resources also include an excellent two-page worksheet for principals to use in assessing how well their schools meet New Urban High School principles, which includes values such as providing common planning time for teacher teams—a great device to share with your administrators!

The VIA Book
ERIC document #:
ED 413 417
<http://askeric.org>

The New Urban High School
<http://www.bigpicture.org>

Individual Projects

In other schools, it is the senior year that is project-based. The senior project is often an individual activity, providing a capstone experience and forcing each student to apply all that he or she has learned. It is an authentic, real-world project leading to a new discovery or a usable product. Teachers serve as advisors. Students are encouraged to make use of the expertise of their peers on particular aspects of their projects (within reason, of course), just as they would in the real world of work. Often, the culmination of the senior project is a major report and an oral presentation, with individuals from business and industry serving as judges.

Where Do You Go from Here?

You've had a brief look at the three levels of integration: Infusion, Linked, and Multidisciplinary. Which level best describes your present situation? What steps can you realistically take to move to a more integrated approach at that level or to move to the next level? The rest of this document is designed to help you answer these questions.

On the next few pages are listed numerous references that can help you learn more about the process of integration. Many of these are filled with real-life examples of the exciting things schools are doing to integrate instruction. Many present hard data documenting that integration can make a difference, not just in students' attitudes, but in their standardized test scores.

The third section of the Ideabook presents strategies and activities you can use to make academic instruction more integrated, more authentic, more relevant to students' occupational programming. You can use them "as is" or adapt them to your particular situation. Some are related to a specific academic area; some cross disciplinary lines. For example, teaching students to think consciously about the thought processes they use (metacognition) helps them learn how to learn. And you can't modify instruction without modifying the way in which you measure student learning; thus, one "idea" focuses on the use of authentic assessment.

The fourth section is about the Information Superhighway—the Internet. You'll find introductory information about the World Wide Web, e-mail, newsgroups, and mailing lists (or listservs), and an abundance of Internet addresses that will get a user quickly to the wealth of educational resources available on the Web.

The fifth section provides a list of curricular resources for applied academics. It's toward the end for a reason. Historically, instruction starts with a textbook. The new teacher is given a text and designs lessons around use of that book, too often in just the order it dictates. But we're talking about a different approach to instruction here, one that starts with the skills students need to survive and thrive in life and at work. It starts with authentic tasks. Materials, then, should be selected to support the mastery of those tasks—preferably a wide variety of materials and preferably some that are authentic (i.e., obtained from the world outside the classroom).

The final section of the Ideabook contains ***excerpts*** from a relevant Ohio-developed Occupational Competency Analysis Profile (OCAP), one key source of information about the occupational, academic, and employability competencies for a given occupation.

Additional References

For more information about academic-vocational integration, consider the following sources:

Allyn & Bacon, Longwood Division
Phone: 800-666-9433; Fax: 515-284-2607
E-mail: <simon@neodata.com>
Website: <http://www.abacon.com>

✓ *Interdisciplinary High School Teaching: Strategies for Integrated Learning*

This guidebook includes ten full-length case studies from real classrooms, plus vignettes and illustrations submitted by hundreds of teachers. Topics include current developments in interdisciplinary and project-based learning, involving multiple intelligences in the learning process, critical thinking, and problem solving. Throughout, the focus is on showing how classroom learning can be invigorated by emphasizing connections between subject areas, the process of learning, and the world of work.

Association for Career and Technical Education (ACTE) Product Sales
(Formerly the American Vocational Association/AVA)
Phone: 800-826-9972; Fax: 703-683-7424
Website: <http://www.acteonline.org>

✓ *Teaching for Understanding Through Integration of Academic and Technical Education*

Explains clearly what integration is and isn't, why it makes sense, what conditions support effective integration, and the ten steps for getting started. Actual high school programs are highlighted.

✓ *Making the Case—for School-to-Careers and Vocational Education*

Demonstrates the value of blending academic and vocational-technical education and debunks outdated stereotypes. Also provides step-by-step instructions for planning promotional campaigns and events that will get media attention and draw public support. Includes a gold mine of positive examples of real programs, solid statistics, and other information nuggets that make the case for strong school-to-careers and vocational education programs.

Association for Supervision and Curriculum Development (ASCD)
Phone: 800-933-2723
Website: <http://www.ascd.org>

✓ *Integrating Academic and Vocational Education: A Model for Secondary Schools*

The authors discuss the potential barriers to integrating academic and vocational education and explain how specific practices can help teachers, business advisors, parents, and students work together to build an effective program that makes schoolwork relevant to students' lives, integrates new technologies into the classroom, and teaches students problem solving and other lifelong learning skills. To clarify their idea of a "seamlessly integrated" curriculum, the authors include examples of learning activities actually used at the Cocoa Academy for Aerospace Technology in Cocoa, Florida. These activities challenge students to apply academic concepts to real-world situations and demonstrate how new technologies can help student learn to research, analyze, make choices, and plan.

✓ *Interdisciplinary Curriculum: Design and Implementation*

Chapters focus on the growing need for interdisciplinary content; design options for an integrated curriculum; intellectual and practical criteria for successful curriculum integration; descriptions of two existing interdisciplinary programs; a step-by-step approach for developing integrated units of study; selecting fertile themes for integrated learning; and integrating thinking and learning across the curriculum.

Instructional Materials Laboratory
University of Missouri–Columbia
Phone: 800-669-2465
E-mail: <iml@tiger.coe.missouri.edu>
Website: <http://iml.coe.missouri.edu>

✓ *A Practitioner's Guide to Integrating Academics*

This how-to manual defines integration, looks at its benefits, examines issues that must be addressed for it to succeed, provides several models for developing integrated instruction, and discusses assessment (of programs, teaching, and student work). Case studies illustrate integration in action and provide helpful tips.

National Center for Research in Vocational Education (NCRVE)

Note: NCRVE–Berkeley closed its doors on December 31, 1999. Some of its materials are now available on a cost-recovery basis from the newly funded National Dissemination Center for Career and Technical Education (NDCCTE):

NDCCTE Product Sales Office; The Ohio State University
Phone: 800-678-6011, ext. 2-4277, or 614-292-4277
Fax: 614-688-3258 or 614-292-1260
E-mail: <ndccte@osu.edu>
Website: <http://www.nccte.com>

An MDS-# beside a publication on the following list indicates that it is available from the NDCCTE Product Sales Office. The documents are also available in the ERIC document collection on microfiche. You can locate the ERIC microfiche collection closest to you, as well as its address and contact information, by checking the following Website: <http://www.ed.gov/BASISDB/EROD/eric/SF>. The ERIC Document (ED) number is provided for each document listed below.

ED 348 529 ✓ *Annotated Resource List: Integration of Academic and Vocational Education*

ED 347 340 ✓ *Assessing the Integration of Academic and Vocational Education: Methods and Questions*

ED 384 804; MDS-870 ✓ *But I've Been Doing This for Years: Informal Integration of Vocational and Academic Education Pilot Test Report*

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✓ *Case Studies of Urban Schools: Portrayals of Schools in Change*	ED 414 407; MDS-958
✓ *Collaborative Efforts Between Vocational and Academic Teachers: Strategies that Facilitate and Hinder the Efforts*	ED 351 526; MDS-164
✓ *The Cunning Hand, the Cultured Mind: Models for Integrating Vocational and Academic Education*	ED 334 421; MDS-141
✓ *Examples of Integrated Academic and Vocational Curriculum from High School Academies in the Oakland Unified School District*	ED 353 472; MDS-483
✓ *General Education: Vocational and Academic Collaboration*	ED 329 734; MDS-057
✓ *Helping Teachers to Understand Their Roles in Integrating Vocational and Academic Education: A Practitioner's Guide*	ED 352 468; MDS-276
✓ *Helping Vocational and Academic Teachers Collaborate to Improve Students' Reading and Writing Skills: An Over-Time Inservice Activity*	ED 351 523
✓ *Integrating Academic and Vocational Education: Guidelines for Assessing a Fuzzy Reform*	ED 334 420
✓ *Integrating Academic and Vocational Education: Guidelines for Secondary School Principals*	ED 355 424; MDS-297
✓ *Integrating Academic and Vocational Education: Issues in Implementing the Carl Perkins Amendments of 1990*	ED 328 763
✓ *Integrating Academic and Vocational Education: Lessons from Eight Early Innovators*	ED 353 407; MSD-287
✓ *Integration of Vocational and Academic Education: Theory and Practice*	ED 348 491; MDS-065
✓ *Making High Schools Work: Patterns of School Reform and the Integration of Vocational and Academic Education*	ED 357 244; MDS-253
✓ *National Roster of Local Practices in the Integration of Vocational and Academic Education*	ED 365 870; MDS-768
✓ *Preparing Teachers to Successfully Integrate Vocational and Academic Education: A Case Study Approach*	ED 389 898; MDS-780
✓ *Teachers' Roles in the Integration of Vocational and Academic Education*	ED 352 485; MDS-275
✓ *Two Worlds: Vocational and Academic Teachers in Comprehensive High Schools*	ED 350 404; MDS-438
✓ *Using Professional Development to Facilitate Vocational and Academic Education Integration: A Practitioner's Guide*	ED 352 456; MDS-277
✓ *What Works: When Teachers Integrate Vocational and Academic Integration*	ED 359 318; MDS-163

Southern Regional Education Board (SREB)
High Schools That Work (HSTW)
Website: <http://www.sreb.org/programs/hstw/high.html>
High Schools That Work in Ohio
Website: <http://www.ode.state.oh.us/ctae/pathways/hstw>

Over 40 Ohio school districts are involved at some level in SREB's ***High Schools That Work*** initiative, which was described by *USA Today* as the "most ambitious and most successful dissemination" of vocational and academic integration in the nation.

HSTW member schools receive the following materials at cost:

- ✓ Guides for planning and implementing *HSTW* in local schools and districts
- ✓ Research reports on programs in improving student achievement
- ✓ ***Outstanding Practices***, an annual publication of successful strategies from *HSTW* sites
- ✓ ***Update*** newsletters on progress of *HSTW* sites and students
- ✓ Announcements of the annual Staff Development Conference and other staff development activities
- ✓ Directory of *HSTW* State Coordinators

Non-members can access these materials through a subscription (currently $75). Ohio educators can also peruse *HSTW* materials by visiting the Reference Library in Room 907 at 65 S. Front Street, Columbus, Ohio. (Hours are 8:00–5:00; Phone: 614-466-3430)

Insert the
"Integration Ideas:
Activities and Strategies"
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Integration Ideas: Activities and Strategies

The ideas in this section are intended to "prime your mental pump"—to give you some starting points for thinking about the activities you will develop for your own program. Although the specific examples used to illustrate each of the following ideas may relate to a single academic or vocational area, the ideas are, for the most part, applicable to all applied academic and vocational teachers.

Some "ideas" are in the form of strategies. Teaching thinking strategies and using authentic assessment, for example, are instructional strategies that are gaining wide use in education. They are included here because they are particularly well suited to integrated programs in which activities and materials are authentic and learning is collaborative.

Other ideas lend specific support to the process of integration. Devices are provided that guide you in looking across disciplines and incorporating relevant materials and concepts as you carry out your instructional planning. Lesson plans developed cooperatively by academic-vocational teaching teams are presented. A sampling of interesting integrated classroom activities are described.

As you look through these ideas, remember: This is just the starting point. With your subject-matter expertise and the collaboration of the other teachers who share responsibility for your students, you should be able to go well beyond these ideas (remembering, of course, that Rome wasn't built in a day).

Teach Thinking Strategies

Teaching students to analyze their thought processes can help them learn how to learn. When you were a student, did you ever have one of those golden mathematics teachers who could look at your incorrect answer and tell you exactly ***where*** you went wrong in your calculations—in your thinking? Such information was far more helpful than just knowing that the answer—the product—was wrong.

Monitoring, thinking about, and questioning the way we process information is called metacognition.

We sometimes tend to focus in class on the correct answer or the desired product, but the process used to arrive at that result is equally as important. As learners, students need help in focusing on process—on identifying the process they are using—and learning to use analysis of process to improve performance. By helping students monitor, think about, and question the way they process information—called ***metacognition***—we can "help them become more independent learners who can recognize and correct their own processing errors."[1]

Metacognition Techniques

One good way to teach thinking strategies is to model them. As you carry out a process in your teaching, think aloud. Explain what's going on in your head—not just what you're doing but how you're mentally ***deciding*** what to do (and what not to do).

Another way to teach thinking strategies is to involve students in a process and then to stop instruction periodically to ask students to look at what they did, what they experienced, what they felt. "In this way, provided there is a general atmosphere of relaxed alertness and trust, students move to deeper levels of understanding because the experience includes dealing with the impact of the process on themselves, including emotional involvement. . . . Students learn the process not as an abstract concept but in relation to their own thinking and behavior."[2]

1 J. W. Philippi, "Developing Instruction for Workforce Literacy Programs" (Springfield, VA: Performance Plus Literacy Consultants, 1989), p. 6.

2 Excerpted from R. N. Caine and G. Caine, *Making Connections: Teaching and the Human Brain* (Alexandria, VA: Association for Supervision and Curriculum Development, 1991), pp. 148, 151, and 169-170. (ED 335 141)

Sample Metacognition Activity

Assume that students in your classes have difficulty locating information on tables or charts or in interpreting that information. Maybe no one ever walked them through the mental processes used to deal with tables. Just saying, "This is a table, and it provides these pieces of information" is not enough for some students. You need to model the whole mental process used. For example:

- Select a table, preferably an authentic one used on the job.
- Give copies of the table to all students.
- Identify the piece of information you want to find using the table.
- Go through the process of finding that information, explaining out loud what you are thinking as well as what you are doing. Do not make any of the "automatic" leaps you usually make as a skilled table reader. Keep it very basic, and spell everything out.

  For example, the exact term or phrase you are looking for may ***not*** be there on the table. You may need to look for a synonym or similar phrase. Tables have headings; do students know about headings? Do they know that a particular symbol can be decoded by looking at the key? Do they know where to find the key?
- Identify another piece of information to find, and repeat the process. Stop periodically in the process, and solicit student input.
- Identify yet another piece of information to find, and let students talk the class through the process.

The next idea—portfolio assessment—includes a large dose of metacognition.

Use Authentic Assessment Tools: Portfolios

This information on portfolios was adapted from Sandra G. Pritz, Lois G. Harrington, et al., Assess Learner Performance (Columbus, OH: Center on Education and Training for Employment, 1997), pp. 25-27, 30.

Students in programs reflecting the real world will complete many authentic job-related tasks involving reading, writing, speaking, listening, calculation, computation, and critical thinking (e.g., problem solving and decision making). Dated artifacts of all these tasks—drafts, final versions, completed exercises, lab work, projects, performance tests, audio- or videotapes—can be kept in a *working folder* to provide a total record of the learner's work. When special pieces are selected from the folder and moved to another, special folder, then the learner has created a *portfolio*. Pieces can be selected for different reasons: to show representative work, to showcase best or favorite work, or to show progress, for example.

Purposes

Having students maintain folders and portfolios is an excellent way to keep the focus on both process and product and to provide a basis for students to review and reflect on their progress as learners in reference to actual work rather than abstract, reductive scores and grades. Unlike material that is "done" once it has been graded, the working folder's contents belong to the learner and can be revisited at any time to be reworked using newly gained skills, increased competence, or fresh insights. This, too, reflects the real world. The portfolio, on the other hand, can serve as a permanent record of achievement.

Folders and portfolios provide a basis for students to review and reflect on their progress as learners in reference to actual work.

But portfolios aren't just a repository of already assessed things; this is an assessment process. The contents of the working folder are used to promote learners' reflection about and assessment of their own work and, perhaps, the work of their peers. Structured assessment activities can be devised related to the ***selection*** of materials for the portfolio. For example:

- Learners can be asked to review the material in their working folder and pick their favorite or best piece and describe, in writing, what they liked about it, what they learned from doing it, and why they consider it their "best" piece.[3]

3 H. A. Fingeret, *It Belongs to Me: A Guide to Portfolio Assessment in Adult Education Programs* (Durham, NC: Literacy South, 1993), p. 26.

- Learners can select two analogous final products developed at different points in the program and compare them to identify indicators of progress.

We have our students prepare portfolios in place of a final exam. The students present their portfolios to a panel made up of teachers, parents, and business people.

William S. Fletcher
Mathematics
Groveport Madison
Freshman School

In each case, the written reflections and evaluations become a part of the portfolio, perhaps as a cover page to the documents assessed or in a separate portfolio log. If materials are judged by others (peers, instructor, others outside the program) as part of the selection process, those "judges" should provide narrative reviews as well, and these, too, should become part of the portfolio record.

These activities can be carried out individually, or students can collaborate as partners or in teams. Collaboration can be particularly helpful early in the program. A student might, for example, identify three favorite pieces and find it difficult to choose just one. A "second opinion" from a peer can provide additional insight and evaluative information that can help in making the final decision. Or, a supportive peer can help identify a "best" piece, with some admirable qualities, in the folder of a learner who's not sure anything there is of value.

Grady suggests other questions that can be used to structure students' reviews and assessments of the work in their folders. These were used originally in a writing class, but they could be easily adapted to other tasks:

- Look back over your work for this semester and discuss the strategies you used for creating it. Think about specific essays. Which were easy for you? Which were most difficult? What have you learned about your methods this semester?
- What do you like about your writing? What do you feel are your strengths? Be as specific as you can; cite essays if possible.
- What are you dissatisfied with in your writing? What areas do you feel need improvement?
- In what specific areas have you grown this semester?
- Discuss your target paper. Why did you choose it? What did you do to revise it to make it representative of your best work?[4]

4 E. Grady, *The Portfolio Approach to Assessment*, Fastback 341 (Bloomington, IN: Phi Delta Kappa Educational Foundation, 1992), pp. 24-25. (ED 356 273)

Structuring Portfolio Assessment

The word *structure* is very important in the use of portfolio assessment. No meaningful assessment of a potentially huge folder full of stuff can occur without it. The first step is to work collaboratively with the learners to answer some planning questions related to that structure. For example:

- ***Will materials from every area of instruction be saved or from just a few selected areas (e.g., written materials only)?*** This can be a crucial question, particularly if you or the learners are new to portfolio assessment. Those who have used the approach strongly recommend starting small. If different types of tasks will be documented, maintaining separate working folders for each may be most practical.
- ***What types of materials will be collected?*** Will the portfolio contain every scrap of paper generated or only certain things? If the latter, what will be the nature of those "things"? Will materials from outside class be included (e.g., lists of books read, budgets prepared)?
- ***How often will materials be selected for the portfolio?*** The selection process can be painstaking and difficult, so selection activities should not occur too often. Furthermore, although reflection on one's work can be extremely valuable and exciting, ***if overused*** it can become tedious; documenting the reflection process in writing can easily become a routine chore rather than a stimulating learning experience.
- ***What criteria will be used for moving the material from the working folders to the portfolios?*** For example, should the portfolio ultimately contain a representative sampling of materials from various points in the learner's progress (what is "best" at different times) or the overall best materials? The criteria chosen should, of course, reflect program objectives.

- ***What process will be used for moving the material from the working folders to the portfolios?*** For example, will the learner make the decision alone, or will peers or the instructor or even outside "judges" participate in the decision-making process? (But remember, if this is truly to be the learner's portfolio, the ***final*** decision should be left to the learner.) Will the selection be justified in narrative form by the learner, or will checklists be devised for learners to use in the selection process; for example, a checklist of criteria defining what "best" means?[5]

Guiding Students in the Decision-Making Process

Once such questions have been answered and a practical structure planned, implementing the approach should become much easier. To help provide the kind of initial guidance learners may need in ***coping*** with making decisions in the face of a folder loaded with material, one teacher has suggested the following procedure:

- Ask the class, "If you were going to put all your work together in a book, how would you organize it?"
- Guide them in brainstorming to identify the many organizational schemes possible (e.g., chronological, alphabetical, subject area, things loved and things hated, successful things and unsuccessful things).
- Then have students actually go through their material and organize it in some way. A great deal of dialogue will occur as they see observable progress—as they encounter things they struggled with once but now have mastered.
- Have them describe, in writing, the organization they chose.
- Once everything is organized, the assessment and selection process will generally seem less overwhelming.[6]

5 Fingeret, op. cit., p. 4.

6 Adapted from material by Melody Schneider cited in Fingeret, op. cit., p. 34.

Advantages

Like performance assessment, portfolio assessment is uniquely suited to the nature of integrated vocational-academic programs. It is learner-centered, focusing on the learner's own work and perceptions about it. All phases in the process—planning, implementation, and assessment—involve collaboration between the learners and the instructor and among the learners themselves. The materials used may involve the tasks the learner will need to perform in the workplace—authentic materials requiring the integrated use of basic skills. And often, development of the materials involves reflection and critical thinking. Perhaps the following best summarizes the value of this assessment approach—

> Teachers struggle with the relationship between their knowledge and judgments and those of their students during the process of assessing portfolios. There are questions about who sets the standards and who assesses the extent to which standards have been met.
>
> It should be remembered that this is not a standardized assessment process. You are not judging the extent to which students have met some predetermined standard set by outside experts in order to compare the work of your students with others' work. You and your students negotiate the standards in relation to the instructional goals and the curriculum, and you have to negotiate progress together as well.
>
> It is important to use your knowledge to help students learn to see their own progress and to give students the benefit of your experience and expertise. At the same time, it is important to learn about progress through the students' eyes, so that there is a richer overall understanding of learning and teaching in the end.[7]

It is important to learn about progress through the students' eyes, so that there is a richer overall understanding of learning and teaching in the end.

[7] Fingeret, op. cit., p. 37.

Examples

Students could produce portfolios to document a project. Not only does this require students to apply skills from their various classes, it also provides a showcase of their work, which they could bring with them to job interviews.

- The vocational teacher introduces the project to students and explains what is to be included in the portfolio: photos documenting their work (both process and product); step-by-step instructions for how to carry out the work; and a cost sheet for the job.
- Students then select something they are working on in their occupational program for their project.
- Students begin to work on their projects, documenting their work in photos.
- The vocational teacher and applied communications teacher meet to discuss the projects selected.
- The applied communications teacher provides instruction in how to write clear, complete instructions. Students then begin to draft their instruction sheets in class, with teacher guidance. The completed instruction sheets are reviewed by both the applied communications teacher (for spelling, grammar, clarity, etc.) and the vocational teacher (for technical accuracy). The students then key their final drafts.
- The applied mathematics teacher can help students with the completion of the cost sheets.

Buckeye Hills Career Center Teaching Team

Sheila Oehler, Chemistry, Anatomy, Physics

Phyllis Rose, Applied Mathematics, Algebra

Robin Schoonover, Patient Care Technician

A process for structuring and evaluating student production of a portfolio of project work was developed by the Buckeye Hills teaching team. Initially, they developed a list of possible portfolio projects for health occupations students to select from—or to help them get started in devising projects of their own. They also developed a scoring rubric for evaluating each project. The team feels it is preferable for teachers to develop their own rubrics (or to modify already-existing rubrics) so that they include the areas that the teachers feel are important to evaluate.

Their guidelines for this activity are as follows:

- Begin the activity, preferably, at the start of the school year, and reinforce with students that this is just one of many tools that will be used to assess progress and performance. It is important that portfolio assessment be perceived as a different and useful type of evaluation, not just more evaluation piled on top of everything else.
- Provide students with both the list of possible portfolio projects and the rubric. Students must know exactly what the criteria for a successful project are before they begin.
- Be extra diligent in grading these projects in a timely manner. Students typically put a good deal of time and energy into these projects, and the teacher must convey a sense of their importance by "dropping everything" to evaluate them. Sometimes it is helpful to involve others (e.g., health professionals from business and industry, members of the audience at a student presentation) in the evaluation.
- Allow students to rework projects in search of excellence after a grade has been received. One way to encourage this is to assign another grade (e.g., at the end of the semester or term) based on a student's best efforts to date. Students should be able to rework individual projects as often as they wish.

Following are the team's list of possible portfolio projects and rubric.

Possible Portfolio Projects for Health Occupations Students

1. Prepare a demonstration using presentation software (e.g., PowerPoint) related to infection control, and present it to the class.
2. Create a flyer for sixth grade students related to skin cancer. The flyer must include information about the detection and prevention of skin cancer.
3. Present a discussion of bone and joint disorders related to aging for the senior citizen's center. Prepare handouts to accompany the discussion. The presentation will be videotaped.
4. With the nursing home activities coordinator, plan and lead an exercise class for residents. The class will be videotaped. Prepare a table listing the exercises to be done and the specific muscle(s) targeted.
5. Visit a rehabilitation center to interview a recovering patient and people who care for patients after stroke, including the nursing staff, physical therapist, occupational therapist, speech therapist, dietitian, and physician. Describe the interrelationship of the health care team.
6. Prepare a poster illustrating major vision defects, including myopia, hyperopia, presbyopia, amblyopia, diplopia, and astigmatism. Visit an optometrist to learn about the diagnosis and treatment of vision defects.

7. Formulate a questionnaire about the symptoms and risk factors for diabetes, which will be distributed to health care students and the teaching staff. Compile the results, and design a bulletin board to post the summary for the school.
8. For students from the senior phlebotomy class: Demonstrate correct venipuncture technique for the junior health occupations classes. Prepare handouts emphasizing the important steps of the procedure, and evaluate student learning. The venipuncture will be videotaped.
9. For students from the senior class: Demonstrate the correct EKG procedure for the junior health occupations classes. Prepare handouts focusing on the important aspects of the procedure, and evaluate student learning. The EKG will be videotaped.
10. Prepare a discussion of coronary artery disease, including information about the signs and symptoms of a heart attack. Develop a handout to accompany the discussion. The discussion will be presented to the senior citizen's center and videotaped.

Scoring Rubric for Health Occupations Portfolio Projects

Maximum Score = 50

Name _____

Quality	5 Excellent	3 Acceptable	1 Needs Improvement	Rating
Factuality	Project is factually correct and contains no errors in information.	Project is mostly correct; however, it contains a few minor errors.	Project contains many small factual errors and/or one or more major factual errors.	
Neatness, Appearance	Project has a very neat appearance and shows evidence of careful attention to presentation.	Project is somewhat neat and acceptable in presentation.	Project is not neat; it may in fact be somewhat messy.	
Evidence of Research	Project contains much information beyond what is included in the text or class notes.	Project contains some information beyond what is included in the text or class notes.	Project contains no information beyond what is included in the text or class notes.	
Effectiveness of Communication	Ideas in the project are communicated clearly. Language supports the communication. There are no spelling or grammatical errors.	Ideas are communicated fairly well. Better word choice might have been exercised. Errors in spelling or grammar are minor and do not detract from meaning.	Ideas are jumbled or unclear. Language choice is confusing or inappropriate. Many spelling or grammatical errors are present.	
Completeness of Information	Project is an appropriate length to cover all relevant information.	Project is a little too short to cover all relevant information.	Project is much too short to cover the relevant information.	
Relevance to Society	Project presents information that is current, important, and useful to members of society.	Project presents information that does not satisfy one of the criteria: current, important, useful.	Project presents information that is not current, important, or useful to members of society.	
Student Reflection	Project contains a self-evaluation that is thoughtfully completed.	Project contains a self-evaluation, but it is trite or inaccurate.	Project contains no self-evaluation.	
Timeliness of Presentation	Student completed project in a timely manner, with project presented on or before due date.	Project was presented 2 days after the due date.	Project was presented 4 days after the due date.	
Creativity, Originality, Interest	Project is very creative, original, and interesting. There are no similar projects.	Project is somewhat creative, original, and interesting. However, other projects are similar or share the same topic.	Project is not creative, original, or interesting.	
Awareness of Audience	Student has chosen an audience for the project, and the information and language are on an appropriate level for that audience.	Student has chosen an audience; however, the ideas presented or language used are not appropriate for that audience.	Student has not chosen an audience for the project	
			Total Rating	

Use Authentic Assessment Tools: Performance Assessments

Performance assessments should have the following three defining characteristics:

- Assessment tools derive from and focus on the ***competencies*** to be achieved. In applied academics classes, this would be the academic tasks described in the performance or enabling objectives (which should derive from the state standards).
- Assessment tools require actual ***performance*** of the task in a functional context (although factual knowledge may be tested separately, using paper-and-pencil methods, as a prerequisite to actual performance). Ideally, performance requires the integrated use of a number of related basic skills, as well as critical-thinking skills (e.g., problem solving and decision making).
- Performance is measured against established process/product ***criteria***.

This information on performance assessments was adapted from Sandra G. Pritz, Lois G. Harrington, et al., Assess Learner Performance. (Columbus, OH: Center on Education and Training for Employment, 1997), pp. 17, 20-23.

Devising the Problem Situation

The problem situation starts with an academic or vocational task selected for the program, preferably one related to the occupational context. For example:

> *Prepare a written report describing an equipment malfunction.*

For the students to perform this task, however, they need more information. What equipment (e.g., autoclave, scale, sphygmomanometer, centrifuge, vaporizer, mechanical lift, oxygen tent, high vacuum evacuator, radiographic equipment)? What kind of malfunction? When did it occur? How often? In short, they need a description of the job-related problem situation: a *scenario*. Use of scenarios is also an extremely effective way of ensuring that assessment requires students to apply their full ***repertoire*** of basic skills in a functional context.

But, you say, I'm an academic teacher; what do I know about the job situation? Scenarios can come from a variety of sources:

- If you are familiar with the job situation, you can devise them yourself.

- You may be able to draw on the information base provided in the OCAP or ITAC to identify and devise problem scenarios.
- If you have a good relationship with students' occupational instructors, they can be tapped for the specific information you need to develop such scenarios.
- Students can develop scenarios—working alone, in small groups, or together with you as a total-class activity.

By involving the students, you can accomplish several very important purposes. Instruction becomes more student-centered, participatory, and collaborative. The problems described are those that actually constitute (or are perceived as) real problems for the students. In order to express those problem situations, the students must communicate: write or speak and listen. They may need to refer to written materials—to read—in order to provide all the facts of the scenario, and they will certainly need to read it once it's written.

Scenarios may also be called *case studies* or *case situations*. As defined by the Center on Education and Training for Employment for use in the development of competency-based learning guides—

- A ***case study*** describes a complete situation, including its solution. The student's job is to critique the process used and results obtained. What did the individual(s) described in the case study do right? What was done incorrectly? How could the process/results be improved?
- A ***case situation*** is open-ended. The problem situation is described, and it is up to the student to devise one or more appropriate solutions.

The situation should be as close as possible to the actual situation a worker might face on the job. The same materials and conditions should be provided.

As an example, consider how the task cited earlier—reporting an equipment malfunction—could be set up as a problem situation:

- Ask the students—as a whole class—to identify a problem involving an equipment malfunction they typically encounter in the vocational lab.
- Depending on the competency level of the students, either elicit the information required for the report, or make students responsible for specifying all the information they need.
- Guide the class in describing the situation orally, with students taking notes. If desired, summarize the descriptive information on a chalkboard or flip chart for future reference.
- Then have students individually develop equipment malfunction reports. If workers on the job would need to refer to equipment manuals or specifications or policy/procedure manuals in reporting the malfunction, then students should do so in the assessment situation as well.

Establishing the Performance Standards

One of the reasons objective test items (true/false, multiple-choice, etc.) have been so very popular is that they are, when well developed, ***objective*** rather than subjective. In other words, the answer is either right or wrong; the judgment of the evaluator is not, for the most part, required.

Grading an essay is harder because subjective judgment is involved. The trick is to ensure that professional judgment is tempered by established criteria defining the expected process and product standards. In applied academics and vocational programs, standards should come, at least in part, from the standards expected on the job. Criterion-referenced checklists can be used to evaluate performance objectively.

Criteria. Checklists can be developed to measure process, product, time factors, attitudes, or a ***combination*** of those elements.

- A ***product*** is something tangible, like a written report or a calculated budget. Sometimes measuring the product alone can tell you everything you need to know; the student could not have produced an acceptable product unless he or she followed the correct process.
- The ***process*** followed in performing the task should be evaluated if you want to track the steps the student performed. Assessing process is crucial when, for example, you can't tell from the final product—a neatly bandaged wound—whether the wound was thoroughly cleaned and disinfected before bandaging. Assessing process ensures that the student doesn't short-circuit any critical steps in arriving at an acceptable product. Process will also be the focus in tasks without a tangible final product.
- Sometimes important ***time*** factors must be measured. If a worker notices an unsafe condition, for example, it may be crucial that he or she be able to communicate the facts of that situation immediately to coworkers and supervisory personnel.
- Often, ***attitudes*** are crucial on the job. The report must not only be written, it must be submitted on time and prepared with a concern for neatness and readability. Information must be communicated orally to coworkers and supervisors not just accurately but also professionally. To measure attitudes, you need to determine what ***behaviors*** would indicate their presence. For example, if the worker is "courteous" in dealing with patients/clients, what does he/she ***do*** to demonstrate that courtesy (e.g., says please and thank you, acknowledges the patient's/client's point of view as valid, volunteers to go the extra mile, maintains a pleasant facial expression)?

It is critical that teens learn the value of people skills—of dealing with patients/clients with a positive attitude.

Susan Steinman
Dental Assisting
Licking County JVS

Rating scales. When you list the criteria together with a rating scale, you have a checklist. Various rating scales may be used; for example:

- yes / no
- not acceptable / acceptable / outstanding
- poor / fair / good / excellent
-

Bear in mind that students may use checklists for self-assessment and, because they're students, may not be able to make fine distinctions concerning level of performance. Therefore, it's better not to devise a 7-point rating scale. Consider, too, that the simple yes/no rating scale has in its favor no emotionally freighted terms like "poor" and "not acceptable."

Checklist qualities. Each checklist should have the following important qualities:

- The checklist should be ***short*** enough to make it practical to use. Perhaps 5 to 10 items are sufficient for a simple skill, 10 to 20 items (at the most) for complex skills.
- The criteria included must be ***critical*** to successful performance of the skill. Minor or trivial criteria just make the assessment job more difficult and time-consuming.
- Each criterion should have some ***qualitative*** base. It is not enough to record that the student did something (e.g., *used capital letters*); he or she may have done it poorly or very well, and this needs to be shown (*capitalized the first word in each sentence and all proper nouns*).
- The items must be ***simple*** and ***unambiguous*** —quickly read and understood by the students and the busy instructor.
- Items should be stated in ***parallel*** terms (e.g., all in the past tense).

To return once more to our example, the following process/product criteria might be appropriate for the task, *Prepare a written report describing an equipment malfunction:*

In preparing the written report, did you—

1. identify the equipment by serial number?
2. indicate the date and time of day (24-hour clock) when the malfunction occurred?
3. describe the exact nature of the malfunction (e.g., sounds made, visual cues, problems, effect on product)?
4. indicate, step by step, the actions you took in response to the malfunction?
5. identify any potential safety hazards involved?
6. suggest any possible causes for the malfunction based on observation or past experience?

Was the completed report—

7. brief and to the point?
8. clearly and simply stated?
9. neat and organized in a way that would be easy to read?
10. directed to the appropriate person or office for action?

When students complete performance tests, the process can also be videotaped so that the vocational teacher and one or more academic teachers can view it and grade it together.

Kimberly Tavenner
Applied Communications
Tolles Technical Center

Administering the Performance Test

The test should not be something you ***do to*** students. Students can be actively involved through self-assessment. (Ability to self-assess is a useful quality on the job.) In competency-based programs, for example, the learning guides are frequently designed so that students practice the given competency and assess their performance against established (explicit, not secret) criteria until they feel competent. It is then up to them to contact the instructor for "final" assessment—to say, "I'm ready."

Even on final performance, students can be involved in the rating process. Differences in student and instructor ratings provide a good starting place in the discussion that should follow assessment. By comparing and discussing rating differences, you can help the student become a more accurate self-assessor in the future.

And if performance is not successful, the student does ***not*** just get a grade and move on. Part of the follow-up discussion in that case would be to jointly devise additional learning activities to help the student gain the required competence. The student would then pursue those activities, practice, self-assess, and request instructor assessment once again. The student would continue to "recycle" until competence is reached. Clearly, it is important to present this as a natural ***learning process*** and not a ***test-fail-retest sequence***.

Student progress through the program, therefore, is not determined by grades earned on units that have been covered and left behind. Rather, it is measured by the ***number of objectives achieved*** — the number of academic or vocational skills demonstrated successfully — as measured by the established or prescribed criteria.

Revisiting Skills

Critics of the competency/performance-based approach like to point out that just because a student performs well once, it doesn't mean he or she will be able to perform equally successfully 3 weeks from now. (These critics do not seem to notice that the same complaint could be justifiably leveled at traditional educational approaches: cram for the test, take the test, forget the material.) Nevertheless, the concern is a valid one. As students' skills build, you should provide test situations that require them to use (and assess) already-acquired skills as well as new ones—preferably in an integrated way. This not only ensures that the skills have really been "acquired," it also serves to reinforce those skills.

As students' skills build, you should provide test situations that require them to use (and assess) already-acquired skills as well as new ones--preferably in an integrated way.

Use Rubrics

This information on rubrics was adapted from Dee Allenspach, Sandra Laurenson, Robin White, and C. Michael Loyd, Alternative Assessment: A Family and Consumer Sciences Teacher's Tool Kit (Columbus, OH: Vocational Instructional Materials Laboratory, 1996), p. 103.

It is crucial that learning goals are well articulated and performance standards are set before students engage in the tasks that will be assessed. Students find it difficult to perform at high levels when the criteria are unknown. One of the best tools for establishing and communicating clear standards on products and performances is the use of rubrics. A rubric is set of scoring guidelines—the standards for assigning scores to student work.

Whereas a checklist gives a list of items to be rated (e.g., The student incorporated verbal examples in the presentation) and then provides a simple rating scale (yes/no, none/fair/good/excellent) that applies to ***all*** items, a rubric provides specific descriptors for rating ***each*** item.

A rubric is a set of scoring guidelines, with specific descriptors provided for rating each item.

For example, to rate a student's vocal expression in making an oral presentation (one item) on a 1-5 scale, descriptors could be provided for levels 1, 3, and 5 as follows:

5 = Uses voice expressively; varies tone to add emphasis
3 = Controls vocal expression; uses some expressiveness and appropriate tone
1 = Voice is unexpressive or monotone

Advantages

A rubric provides teachers, as well as students who are self-assessing, with more guidance in determining ratings—it helps make the assessment more objective. It also provides students with more specific information to use in improving their performance. In short, use of rubrics has the following advantages:

- Rubrics promote learning by offering ***clear, up-front performance targets*** to students, which allows them to see what mastery (and various degrees of mastery) of the task looks like. Students will know the basis for judging what constitutes exemplary/proficient, adequate/satisfactory/acceptable, or novice/beginner/amateur work before they begin.

- Presented to students along with the performance/assessment task, rubrics provide students with ***"road signs"***—information about where they are in relation to where they need to be.
- Rubrics increase ***consistency*** in the rating of performances, products, skills, and understandings.
- Students are able to assess their own work based on ***specific standards/criteria*** and to "work up" to those standards.

To review the rubric developed by one teaching team for assessing health occupations portfolio projects, see p. 70.

Application of Rubrics

A 1996 SREB publication,[8] describes the use of rubrics by English teachers at Delcastle Technical High School in Wilmington, Delaware. The teachers use a locally developed rubric to evaluate students' writing assignments. Each assignment is graded on a point system, with one to four points awarded for each category. An average point value of 3.5–4.0 means that a student's assignment meets standards; 2.5–3.4 means that it approaches standards; and 2.4 and below means that it fails to meet standards. Students and teachers refer to the analytic scale shown on the following pages in deciding what point value to assign.

[8] G. Bottoms and D. Sharpe, *Teaching for Understanding through Integration of Academic and Technical Education* (Atlanta, GA: Southern Regional Education Board, 1996) pp. 25-27.

Writing Rubric: Analytic Scale

Topic

4 The assigned topic is carefully developed and supported by many relevant details.

3 The writer provides some insight or depth of understanding to the assigned topic. He/she is mainly on topic, but more development of details is needed.

2 The development of the assigned topic is generalized and lifeless. For the most part, only generalities are provided. The writer may stray from the topic.

1 The writer communicates no real understanding of the assigned topic and appears to have given little thought to selecting details that would enhance development.

Organization

4 The response is organized and unified, with smooth transitions and a clear, logical progression of ideas. If the composition is multi-paragraph, it has an introduction, only one topic per body paragraph, and a closing.

3 The order of ideas is generally clear to the reader because the writer has tried to order his/her ideas. Some transitions may be used, but they don't always support the orderly flow of ideas. In a multi-paragraph assignment, the paper may lack an effective introduction or closing. It may also treat more than one topic per paragraph.

2 Although there may be some attempt to present ideas in an orderly way, the general impression is that the paper is confused and disorganized.

1 The paper has no discernible order of ideas.

Delcastle Technical
High School;
Wilmington, Delaware

Style

4 The writer demonstrates a quality of imagination and individuality that results in a distinctive way of expressing him- or herself. Where suitable, the writer states what he/she really thinks and feels.

3 The writer may include some personal details and comments where suitable but also uses generalizations or vague language at times. While the paper may be correct, it lacks a consistent expression of style.

2 The writer rarely uses personal details or comments. The style seems bland, guarded, flat, and not very interesting.

1 The writer demonstrates no recognizable individualistic style.

Word Choice

4 Words are specific and used accurately in a thoughtful, imaginative, and vivid way. Clichés and "a lot" are avoided. Similes, metaphors, and other figurative language may be used.

3 Some words are specific, thoughtful, imaginative, and vivid.

2 Common, stale words are used in the same old way. The repetition of words and phrases distracts the reader.

1 Word choice is limited and immature. Sometimes the word choice is inappropriate.

Sentences

4 The sentences are varied in length and structure, showing a control of sentence structure. The paper reads smoothly from sentence to sentence. Run-on sentences or sentence fragments are avoided. Correct punctuation makes sentences clear and easy to understand.

3 The writer shows some control of sentence structure and only occasionally writes a sentence that is awkward or puzzling. Most sentences are punctuated correctly.

2 The writer has definite problems with sentence structure. Some sentences are short and simple in structure or childlike and repetitious in their patterns. Sentence formation errors may be present.

1 There is almost no evidence that the writer has a command of English sentence structure.

Conventions

4 There are no obvious errors in spelling, punctuation, capitalization, and usage (verbs, pronouns, homonyms, etc.). The writer shows that he/she is familiar with the standards of edited written English.

3 A few errors in spelling, punctuation, capitalization, and usage appear in the paper, suggesting that the writer has not been consistent in using standard forms. Errors do not substantially detract from the overall effectiveness of the paper.

2 Errors in spelling, punctuation, capitalization, and usage are so numerous that they are distracting to the reader.

1 Errors in standard written English are serious and frequent enough to interfere with meaning.

Use Periodicals

Occupation-specific or general career magazines and local, regional, or national newspapers can provide a rich source of classroom activities.

Sources of Materials

The following are just a few of the types of sources you might consider for use in your classes:

- Do your students belong to a vocational student organization? If so, they probably receive copies of the organization's journals. For example:

  SkillsUSA–VICA
  Phone: 703-777-8810; Fax: 703-777-8999
  E-mail: <anyinfo@skillsusa.org>
  Website: <http://www.skillsusa.org>

  Health Occupations Students of America (HOSA)
  Phone: 800-321-HOSA; Fax: 972-874-0063
  E-mail: <info@hosa.org>
  Website: <http://www.hosa.org>

- What about professional associations? Many of these provide its members with magazines and newsletters. For example:

  American Dental Assistants Association (ADAA)
  Phone: 800-SEE-ADAA; Fax: 312-541-1496
  E-mail: <adaa1@aol.com>
  Website: <http://members.aol.com/adaa1>

  American Dental Hygienists' Association (ADHA)
  Phone: 312-440-8900
  E-mail: <mail@adha.net>
  Website: <http://www.adha.org>

  National Association of Dental Laboratories (NADL)
  Phone: 703-610-9035; Fax: 703-610-9005
  E-mail: <nadl@nadl.org>
  Website: <http://www.nadl.org>

  American Association of Medical Assistants (AAMA)
  Phone: 312-899-1500
  Website: <http://www.aama-ntl.org>

Occupation-specific or general magazines and newspapers can provide a rich source of classroom activities. The types of activities they support are limitless.

American Medical Technologists (AMT)
Phone: 847-823-5169; Fax: 847-823-0458
E-mail: <amtmail@aol.com>
Website: <http://www.amt1.com>

American Society for Clinical Laboratory Science (ASCLS)
(formerly American Society for Medical Technology)
Phone: 301-657-2768; Fax: 301-657-2909
E-mail: <ascls@ascls.org>
Website: <http://www.ascls.org>

American Health Care Association (AHCA)
Phone: 202-842-4444; Fax: 202-842-3860
Website: <http://www.ahca.org>

National Association for Home Care (NAHC)
Phone: 202-547-3540; Fax: 202-547-7424
Website: <http://www.nahc.org>

American Nurses Association (ANA)
Phone: 800-274-4ANA; Fax: 202-651-7001
Website: <http://www.nursingworld.org>

National Association for Practical Nurse Education and Service (NAPNES)
Phone: 301-588-2491; Fax: 301-588-2839

National Federation of Licensed Practical Nurses (NFLPN)
Phone: 800-948-2511; Fax: 919-779-5642
Website: <http://www.nflpn.org>

American Dietetic Association (ADA)
Phone: 800-877-1600
Website: <http://www.eatright.org>

American Society of Radiologic Technologists (ASRT)
Phone: 800-444-2778; Fax: 505-298-5063
E-mail: <communications@asrt.org>
Website: <http://www.asrt.org>

- Do (or could) your students subscribe to a career-focused magazine such as *American Careers*? Career-related articles and statistics provide a natural jumping-off place for a wide range of classroom activities. Furthermore, magazines developed specifically for classroom use generally come with a teacher's guide detailing creative ways of using the articles in each issue.

  American Careers, Career Communications, Inc.
  Phone: 800-669-7795; Fax: 913-362-4864
  E-mail: <ccinfo@carcom.com>
  Website: <http://www.carcom.com>

- Many newspapers provide classroom sets of their papers for a limited time period, either free of charge or at a discounted rate. Some major papers (e.g., those in large cities, *USA TODAY*) also provide teaching guides to support use of the materials.

  USA TODAY
  Phone: 800-757-TEACH
  Website: <http://www.usatoday.com/educate/home.htm>

- You may be able to arrange to have your branch of the U.S. Postal Service keep undeliverable magazines for you to pick up periodically.

- And don't forget the Internet. A number of magazines, newspapers, and news networks offer relevant online features and articles. For example:

  Dental Hygienist News
  <http://www.dentalcare.com/soap/journals/dh_news/dhnmenu.htm>

  Journal of the American Dental Association (JADA)
  <http://www.ada.org/adapco/jada/j-menu.html>

  American Medical News
  <http://www.ama-assn.org/public/journals/amnews/amnews.htm>

  CBS HealthWatch
  <http://cbs.medscape.com>

  CNN: Health
  <http://www.cnn.com/HEALTH>

  Good Health Magazine
  <http://www.goodhealth.com/gh_mag>

Internet Medical Journal
<http://www.medjournal.com>

iVillage: allHealth
<http://www.allhealth.com>

Journal of the American Medical Association (JAMA)
<http://jama.ama-assn.org>

New York Times Syndicate: Your Health Daily
<http://yourhealthdaily.com>

NurseWeek/HealthWeek
<http://www.nurseweek.com>

OnHealth
<http://onhealth.com>

Real Health
<http://www.hc-sc.gc.ca/real>

ReutersHealth
<http://www.reutershealth.com>

USA TODAY: Health
<http://www.usatoday.com/life/health/lhd1.htm>

Washington Post: Health
<http://washingtonpost.com/wp-srv/health/front.htm>

A number of Websites—some searchable—are also available to link you to extensive lists of online medical/dental/health periodicals, including—

<http://www.dentistry2000.com/dentaljournals/index.html>

<http://www.vh.org/Beyond/Dentistry/journals.html>

<http://www.cp-tel.net/pamnorth/journal.htm>

<http://www.gretmar.com/webdoctor/journals.html>

<http://www.internets.com/mednets/nursingjournals.htm>

<http://www.mco.edu/lib/instr/libinsta.html>

<http://www.mosby.com/periodicals>

<http://www.sciencekomm.at/journals/medicine/med-bio.html>

<http://www.wwnurse.com/nursing/journals.shtml>

<http://www4.ncbi.nlm.nih.gov/PubMed/fulltext.html>

These are high-interest materials containing relevant, real-world information, and the types of activities they support are limitless.

Classroom Applications

An ***applied communications*** teacher could use activities such as the following:

- Have students read an article or editorial on a controversial subject and then participate in a class or panel discussion or debate. Discuss fact versus opinion and loaded language.
- Teach (or review) how newspapers are typically structured and laid out, and then ask students to locate specific articles or types of information in the paper. For some classes, making this a competition will add motivation.
- Teach how newspaper articles are typically structured (e.g., using the inverted pyramid structure; answering the 5 W's in the lead paragraph). Then have students complete activities related to that structure, such as answering the 5 W questions for given articles.
- Have students identify a job they'd like or a car they'd like to own and then find out facts and figures related to that choice using the classified section of the newspaper. Have them pick the three jobs/cars advertised that seem to be most desirable and explain the criteria used in making their decision.
- Ask each student to skim the newspaper headlines (or journal article titles) and pick an article of interest to read and report on orally to the class. Have students take notes and briefly outline their presentations before making them. To minimize duplication, divide the class into smaller groups, and give each group one section of the newspaper to pick from.
- Students could each be assigned an article to skim and asked to circle each unfamiliar word. They could then use prefixes, suffixes, roots, context, etc., to try to define the words. Through class discussion, the words could be shared and tentative definitions could be improved.

To the extent possible, have students focus these activities on articles related to their health services specialty. For the debate activity, for example, a recent check of online periodicals quickly uncovered a number of health-related articles covering such controversial topics as the following:

- Medical, moral, and financial costs of fertility treatment and multiple births
- Recent Medicare ruling recognizing some nurses and physician assistants as independent practitioners (and raising the ire of many physicians)
- Role of the dental hygienist in identifying and reporting signs of possible child abuse

In addition to using the newspapers to follow the performance of their selected health-related stocks, students could be asked to use the newspapers to research how stock performance relates to what is going on in the world (e.g., a health care crisis, rising insurance costs).

Marlana Marquess
Applied Communications
Portage Lakes Career Center

An ***applied mathematics*** teacher can make very effective use of the charts and tables and statistics found in most newspapers and many journals, such as sports statistics, health-related stock market data, and top 10 movies.

- Have students read and interpret the data provided.
- Give students scenarios or problems and ask them to use the data in responding to the scenario or solving the problem.
- Assign long-term projects as well. For example, have students build a database of statistics over time for a specific sports team or select a stock to "buy" and then follow and chart its progress.

An ***applied science*** teacher can find ideas for activities in articles or business sections featuring new technology, particularly technology related to students' occupational area(s). For example, a recent online *New York Times* article focused on the unparalleled insight into the human body that will be provided using the new three-dimensional ultrasound technology. Science is embedded in the health services, so finding science content in health-related newspaper and journal articles should not be difficult. For example:

- An article on the latest dietary demon—trans fatty acids—could lead to activities comparing trans fatty acids to cholesterol and saturated fat (e.g., source, composition, effect on blood lipids).

- An article criticizing reports that claim that the mercury in dental fillings is a health hazard could lead to discussion of the scientific validity of the statements the author makes in support of his argument (e.g., "When mixed, mercury, silver, tin, copper, and zinc bond to form a strong, stable substance that does not contain metallic mercury").
- An article on what may turn out to be the first new class of antibiotics discovered in the past 25 years could lead to research on bacteria and how they become drug-resistant.
- An article on the need for consumers to make better decisions about generic drugs could lead to comparisons of the active and inactive ingredients in various "equivalent" drugs.

Simulate the Workplace

Some students come late to class. They skip school. They turn in homework late or not at all. Assignments that are turned in are carelessly done, sloppy, and incomplete. They treat the teacher—and each other—with little respect. So what? they say; it's only school.

Many teachers have found that when they turn the classroom into a workplace and treat their students as workers, there is great improvement in both attitude and performance.

In Instruction

For Thomas Grandy, an applied communications teacher at Ashland-County West Holmes Career Center (Ashland, OH) whose students were in Business programs, this meant turning his classroom into a simulated business: ComQuest: A Communications Catalyst. Students were employees of this company; Grandy was the CEO.

Many teachers have found that when they turn the classroom into a workplace and treat their students as workers, there is a great improvement in both attitude and performance.

Classes were run like business meetings, with activities centered around fictional companies or lab experiences (and a strong focus on the SCANS competencies). For example, there were discussions on work relationships and professional issues. To reflect the real world of work in which time is limited, students were required to keep the discussion focused; at the end of the activity, they had to write a synopsis.

Students were also asked to do magazine research of career-specific topics. Other activities included business correspondence, telephone etiquette activities and role play, customer relations study and role play, and teamwork activities (e.g., "human knot," in which a circle of students hold hands in a tangled way and must communicate to get untangled).

Grandy's approach could be easily adapted for students in health services programs by simulating a health care business (doctor's or dentist's office, nursing home, etc.). For the activity on writing effective instructions, students could focus on typical tools and equipment used in the health services lab (e.g., sphygmomanometer, autoclave, anesthetic aspirating syringe).

Portage Lakes Career Center Teaching Team

Marlana Marquess, Applied Communications

Debra Sawhill, Diversified Health Occupations

Kathy Subity, Mathematics

When businesses sell products, a technical writer must develop instructions for their use. Thus, Grandy's activities also involved writing effective instructions. In one activity, he had students bring in a collection of tools from their lab and work in teams of four to write a set of instructions for each tool. In another activity, he provided a strange collection of kitchen tools and antique tools. Groups of four then had to identify the real—or imagined—purpose of a selected tool and write a set of instructions for its safe use.

On the job, you're paid by the products developed, by the time on task. Thus, Grandy had students keep logs of their activities in lab for one week. The logs were then used as a basis for lessons on effective time management.

As more technology has become available, the activities in his classes have become more sophisticated. Students now participate in an international business study, conducted online with Russian students. They use real customers in some of the projects, which provides opportunities for real-world experience in effective communication. Grandy finds that the feedback students receive from customers concerning their performance has a great deal more credibility (and is more likely to result in improvement) than that provided by the teacher.

ComQuest's Website can be found at <http://www.tccsa.ohio.gov/dp/awhj>. The CEO can be reached by e-mail at <awhj_grandy@tccsa.ohio.gov>.

One teacher at Scarlet Oaks Career Development Campus (Cincinnati, Ohio) has students clock in and out daily using a time clock located in the vocational lab. At the end of the week, they take their time cards to mathematics class where they compute hours and "pay" (based on industry entry-level wages). They are given "raises" based on grades in ***all*** classes and "bonuses" based on outstanding performance in ***any*** class. Students open "checking accounts" and deposit their weekly "paychecks." Before Winter Break, there is an auction with lots of donated items, and students can bid on items using the "money" in their "checking accounts."

In Assessment

Another truth about the real world of work is that when a worker hands in unacceptable work, he or she doesn't get a grade and another assignment. In most cases, the work is handed back to be made right. Thus, you can also simulate the workplace in your assessment practices.

According to Ted Panitz <tpanitz@mecn.mass.edu>

> I use a mastery approach to testing where I check mathematics exams for correct answers and return the papers for corrections during the exam. I do not give partial credit at this point; I simply circle the problems that are not correct. The passing grade is 80% after the corrections are completed and if students obtain the 80% I then keep returning the tests until the student has 100% correct answers. The emphasis is on understanding the problem, not the grade, and all students become capable of obtaining a perfect test.
>
> The effect of this approach is to empower the students, create a positive assessment atmosphere, and encourage students to take more responsibility for their learning and success. This approach encourages students to keep trying problem solutions until they figure out how to solve a problem. It helps them get past the problem of making silly mistakes that imply they do not understand a concept because they did not get the exact right answer. It demands that they keep thinking about a solution until they resolve in their minds how to complete it.[9]

Through Media

Another way to bring the world of work into the classroom is to videotape it. A teaching team from Ohio Hi-Point Career Center (Bellefontaine, Ohio) set out to produce a simple video presentation for students in one vocational program on why academic skills are so critical in the world of work. The video would show owners and managers of related businesses explaining the mathematics and communications skills required on the job—the skills they look for when hiring (or promoting) workers.

[9] T. Panitz, "How Do You Communicate High Expectations to Your Students in Order to Encourage Their Success?" *School-To-Work News* (July/August 1996): 5.

But this was a team project that just grew and grew:

- They consulted the school's media specialist and decided to produce an interactive CD instead. Using CD technology would provide for user interaction and more versatility.
- When the team members learned how much data could be stored on one disc and how easy it would be to sort and access the data, they decided to cover ***all*** related programs in the career cluster in the presentation. They also decided to cover not only the retail side of the business, but also the supply side and the manufacturing side.
- Instead of just interviews (talking heads), plans now call for reinforcing interview comments by showing employees actually using those academic skills on the job whenever possible. Alternatively, footage can be taken of vocational students applying those skills in the vocational labs.
- Initially, the team members planned to do most of the taping themselves, but on further thought, they decided to use students to do the interviews and produce the CD presentation. The media specialist is helping students learn how to transfer material to CD. Students in graphic arts classes are developing graphics for the CD. Students in applied communications classes are working on interview techniques.

Because students seem to pay far more attention to the owners and supervisors of the companies in which they hope to work, the team hopes that using this CD in future classes will help provide some much-needed motivation for students to master academics.

Incorporate Projects

Projects can be a wonderful kind of hands-on activity when they involve creativity and teamwork and problem solving. They also allow many opportunities to build communication skills. Projects tend to be multidisciplinary, even when conducted within a single course, involving, for example, knowledge of the occupation, oral presentation skill, mathematical calculations, and a written product. However, projects can also be the focus of instruction in two or more courses. The following is a sampling of approaches and projects you might want to incorporate into your instruction.

Projects can involve creativity, teamwork, problem solving, and opportunities to build communication skills.

One caution should be mentioned here: Keep it fresh! When a perfectly good project is used year after year, it can lose its effectiveness. Assume, for example, that an applied communications teacher has a class track down all the safety hazards in the school facility and develop a brochure on school safety to be shared schoolwide. Great activity—authentic, with an actual, useful application. But if that teacher tries the same project with next year's class, it's just busywork. The class members know the task has already been done; they have copies of last year's brochure in their possession. It's time for a new project.

Rube Goldberg Approach

With this approach, students invent an extremely complicated—and usually silly—device that uses a series of mechanical actions to complete a very simple task such as setting off a mousetrap. It works like this:

- You (or students) bring in a variety of household items (often trash, like cardboard paper-towel tubes).
- Small groups of students are asked to pick a problem (e.g., bursting a balloon) and use the available items to design, build, and demonstrate a device that will solve it. You may specify the criteria to be met (e.g., the device must have a minimum of five mechanical actions and reactions).

For a list of possible health services projects used for portfolio assessment, see pp. 68-69.

- Once the projects are completed, students present their devices. They can be evaluated not only on the quality of their projects but also on the effectiveness of their presentation skills. By videotaping these presentations, you can build a library of examples that can be enjoyed by students in the future.

LEGO® Project

Thomas Grandy, applied communications teacher at Ashland-County West Holmes Career Center (Ashland, OH), has students build something using LEGO® blocks and write up specific instructions for how the structure was built. The structure is then taken apart, and the LEGO® blocks and the instructions are placed in a plastic bag. Students trade plastic bags, and each student tries to recreate the original structure using the instructions. If the instructions are not adequate, they are returned to the author for revision.

Canterbury Tales with Online Glossary
<http://www.librarius.com>

Chaucer Projects

Darla Boram, applied communications teacher at Upper Valley JVS (Piqua, OH), approaches the study of Chaucer from a project point of view. She starts with a unit on mythology to help unlock some of the allusions in the work. She interweaves information on the Middle Ages, talking about things with high student appeal, like chivalry, and bringing in lots of high-interest books on castles and such. Since the language of the original *Canterbury Tales* is, in essence, a foreign language, she uses a translation that is easy for students to understand, while maintaining the rhythmic quality of the original. Classroom instruction focuses on just the Prologue and a few of the tales. And the culminating project? Students develop a book of their own *American Tales*—written in iambic pentameter. Secretarial and data processing students key the book; graphic arts students bind the books. A book cover design contest can also be part of the project.

For students in health services programs, a *Canterbury Tales* unit could easily involve occupation-related activities that cross classroom boundaries. One of the pilgrims is a physician, which could lead nicely into a study of different aspects of medieval medicine in applied science, applied communications, and health services classes.

What illnesses and diseases would the pilgrims have had to worry about, how would they have been treated, and with what general results? Topics for research and study could include—

- Plague (Black Death)
- Medieval Medical Roles: Surgeons, Physicians, Barber Surgeons, Nurses, Midwives, Herbalists
- Medicinal Herbs Then & Now
- Bloodletting
- Role of Humors in Good Health

One excellent Website for secondary students is The Annenberg/CPB Project Exhibits Collection site, which provides clear, simple information on what it was really like to live in the Middle Ages, with pages on feudal life, religion, homes, clothing, health, arts & entertainment, town life, and related resources. As part of the health pages, students can try their hand at medieval medicine. Three patients and their symptoms are described. For each, students are given three possible healing methods of the time from which to choose. For example, if you suspect the patient has plague, would you apply sterile egg whites, give the patient a treacle, or swaddle the patient and shave the sign of the cross into her head? Additional information about symptoms and healing methods is also provided.

Annenberg/CPB Project Exhibits Collection
<http://www.learner.org/exhibits/middleages/morhealt.html>

Other Websites such as the following could also help in the research process:

Women and Medicine in Medieval Times
<http://www.millersv.edu/~english/homepage/duncan/medfem/womed1.html>

The Pestilence Tyme: England During the Plague of 1348-1350
<http://www.labs.net/dmccormick/plague.htm>

Medieval Science Page
<http://members.aol.com/mcnelis/medsci_index.html>

Middle Ages / Medieval History
<http://orb.rhodes.edu>
<http://britannia.com/history/h60.html>
<http://www.nyu.edu/gsas/dept/history/internet/geograph/europe/medieval>

Internet Medieval Sourcebook: Medieval Texts Online
<http://www.fordham.edu/halsall/sbook.html>

For applied mathematics classes, students could focus on Medieval mathematicians and their contributions to modern math. One Website that provides a list of mathematicians through the year 1500 is <http:aleph0.clarku.edu/~djoyce/mathhist/europe.html>.

Planning & Proposal Projects

Susan Steinman has students in her dental assisting program at Licking County JVS develop a list of the minimum supplies, equipment, instruments, etc., necessary to open a small dental practice. The list must include number, size, and cost. This project makes students appreciate the huge expense of opening a dental practice. They could also design the office and its floor plan.

This project could be expanded into academic classes. In applied mathematics classes, students could work on calculating relative costs and displaying cost elements in ways that facilitate decision making. In applied communications classes, students could develop survey questions to use in interviewing personnel in local dental practices concerning their inventories and layouts. In applied science classes, students could study environmental and safety concerns in medical office facilities.

Students could present their startup plans to a panel of adults (perhaps dental personnel), who could provide feedback on how well the plans reflect reality.

The teaching team from Portage Lakes Career Center suggests that similar projects could focus on having students develop a plan to set up a student wellness program or all aspects of a bone marrow drive. Again, these plans would need to include steps to be taken, materials and supplies needed, budget requirements, and timelines.

Caryn Jackson, a mathematics/science teacher at Tolles Technical Center (Plain City, Ohio), suggests use of a proposal development project focusing on the provision of a stress management training program for employees at an imaginary company. Development of the proposal would require skills from multiple disciplines. Students would need to research stress, its physiological and psychological effects, and stress management techniques; determine costs for conducting the training program (personnel, time, facilities, materials); do cost-benefit analyses; and develop an effective written proposal as well as materials to promote the program.

"Best Place to Live" Project

A long-term project at Canton High School and Canton Career Center in Mississippi was described as follows:

> Students searched for the best U.S. city and region in which to live. Teachers from the academic areas of English, algebra, physics, and social studies worked with vocational teachers to plan the project. For each city selected, the students obtained information on size and population, architecture, racial makeup, living conditions, and regional technology.
>
> Students were evaluated on data collection and analysis; use of communication skills in designing a questionnaire and writing cover letters to obtain information; design and organization of a scrapbook of data and articles on the cities; an oral presentation on research findings; design and construction of a plywood map showing cities and regions; and decision-making skills.[10]

Students in health services programs could be asked to look at the selected cities/regions in terms of health services jobs, health risk factors, medical care available, environmental issues, and educational opportunities.

Portage Lakes Career Center Teaching Team

Marlana Marquess, Applied Communications

Debra Sawhill, Diversified Health Occupations

Kathy Subity, Mathematics

Career Magazine Project

Development of a career magazine can also be an effective multi-course project. Students can work in applied communications classes to research jobs within their occupational area. They can work with the applied science teacher to identify and learn about new technology related to the field—another source of articles for their magazine. In applied mathematics classes, they can summarize data related to the field (e.g., percent of growth in each job over the last 10 years) and develop charts and graphs to present that data.

10 "Progress Reports: HSTW Sites Share Integration Activities." *Integrated Learning* (January 1996): 12.

BEST COPY AVAILABLE

Advertising Project

In this project, instruction in applied communications focuses on advertising techniques and the influence of advertising on consumer purchases. Then students are teamed, and each team develops an advertising campaign—a 1-minute television or radio ad, or a newspaper or magazine ad—to promote a selected pharmaceutical product (e.g., cold medicine, stomach medicine). Students select ***one*** advertising technique (humor, celebrity endorsement, popularity, improved appearance or health, bandwagon, or status) as a focus for the ad.

Work in other classes supports this project. In health services classes, for example, students learn how to use the *Physicians' Desk Reference* (PDR) to find basic information about various drugs. In applied science, they compare the chemical composition of various medicines and study the effects of administering drugs in different forms (e.g., capsule, lozenge, tablet) and via different routes (e.g., oral, sublingual, topical). In applied mathematics, they work on metric measurement and dosage calculations. In applied communications, they review the meaning of relevant prefixes (e.g., kilo, hecto, deka).

Students could present their advertisements to students in other classes and get feedback on their effectiveness from those "consumers." Would they be likely to buy the product based on the advertisement? If so, what appealed to them? If not, why not?

Junior/Senior Project

Each year, students are responsible for conducting a research project on a health-related topic and preparing a final paper reporting on their work and findings. In the project, as well as the paper, students are responsible for integrating skills and information from their vocational and academic coursework. The timeframe for the work is January through May.

Junior Year: The topic selected must be fairly specific (e.g., neurological diseases), with the assumption that the junior experience will prepare for a wise choice in the senior year. The final paper must be 8 pages long; a limited number of technical errors are permitted.

Fairfield Career Center
Teaching Team
Anne Conner, Allied Health
Larry Friend,
Applied Science/Mathematics
Shelley Hurst,
Applied Mathematics

Senior Year: The topic selected is broader (e.g., disease in general). The final paper must be 12 pages in length and is expected to be error-free.

These projects are a major accomplishment for both the students and teachers. A lot of teacher time is necessary to ensure that the work is integrated between the vocational lab and academic classroom. Teachers in each academic area prepare guidelines for the project work: rubrics for evaluating each component, time schedules, steps to be completed during the process. Teachers must also consult regularly with students—and review work completed—to be sure students have a topic that can meet all the requirements and to keep them moving toward deadlines as scheduled. Teachers must schedule specific times to talk individually with students and be prepared to answer questions as needed during the process. Otherwise students may become lost, given the size of this effort.

Applied Communications Requirements: Students must prepare the paper in accordance with the requirements of Modern Language Association (MLA) format. They must also develop a timeline for the completion of each phase of the project, including submission of a letter of intent for the topic, rough draft, final paper, and oral presentation. The work comprises the final examination grade in applied communications.

Applied Mathematics Requirements: The paper must include graphs or statistical tables that are relevant to the information. Areas represented could include age, race, geographic placement, gender, generational trends, and probability. This work constitutes half of the final examination grade in applied mathematics.

Applied Science Requirements: The junior paper must include a minimum of three-quarters of a page of physiology. The senior paper must include at least one page of chemistry. The material does not have to be presented all together in one section; it may be integrated throughout the paper. It is frequently necessary to point out to the students that a listing of body parts or chemical formulas does not fulfill the requirements. The papers must elaborate on the nature of reactions cited or details of how the body reacts or is changed. The science component constitutes one major grade for the grading period.

Social Studies Requirements: Students must tie their topic to American culture in the junior year and to world culture in the senior year. For example, they would need to show the impact the selected disease has had on society (e.g., the social impacts of the Black Plague; the development of charity institutions). Information from at least two sources must be cited, and statements made must represent fact and not author opinion. This work constitutes half of the final examination grade in social studies.

Vocational Requirements: The lab teacher supplies a rubric for evaluating how well the student has (1) related the chosen topic to four areas: society, the individual, health and safety, and communication to the public; and (2) demonstrated that the information was gained through four or more different types of activities. The rubric details how the grade changes if these parameters are not met. The teacher uses the lab requirements in the nine-weeks grade and the overall group evaluation as the final examination grade.

Oral Presentation Requirements: Minimum and maximum time constraints are set for the presentations. Each presentation must include a visual component; seniors are required to use PowerPoint. The final oral presentation is evaluated by the faculty team using a grading sheet prepared in advance and supplied to the students. The final project grade is determined by averaging the individual evaluation forms to determine an overall presentation grade. This grade is used by each instructor as either part or all of the final examination grade for the class.

The first year of the projects produced mixed results. Initially, there was a wide range of quality, but there has since been evidence of growth from the junior to the senior year. The teaching team is still refining the parameters of the project from year to year, but the activity has proven to be successful enough that they plan to continue. Many of the vocational students in the involved classes have declared intentions of attending school beyond high school, and the teachers feel this activity helps them to develop the skills necessary to succeed in further education.

Use Demonstrations and Discovery

Science and mathematics lend themselves very nicely to the discovery—or inquiry—method. Instead of presenting a formula or scientific principle to students and then moving on to application, start with the application and let students try to deduce the formula or principle themselves.

Many books are filled with demonstrations and experiments that can be used in this way (some are listed in the fifth section of this document). The best demonstrations/experiments are those that present the principle in relation to the students' occupational area. But regardless of the content, it is critical that the activity move beyond simple fun to the discovery of the underlying principle. You may get students' attention when you perform what looks like (and may in fact be) a dangerous task, but their attention is worth little if learning does not occur. An ideal way to ensure that the principle has been learned is to follow up the first demonstration/experiment with a completely different one in which the same principle applies.

It is critical that the activity move beyond simple fun to the discovery of the underlying principle.

Demonstrating a Science Principle

To teach the characteristics of nonutonian fluids, one applied science teacher used a cornstarch and water mixture. The mixture increases in viscosity the faster you move it. If you slowly insert and remove your finger, the mixture acts like a liquid. If you jab it quickly, the mixture resists penetration like rubber. If you try to pull your finger out quickly, the mixture grabs the finger and hangs on.

Likewise, if you want students to understand the importance to human beings of having clean air in their work environment, why not set up a demonstration that shows the effects of different air quality (e.g., clean air and air from a "sick" building) on living plants?

Such activities could be applied to the dental field using dental products such as alginate composites [irreversible hydrocolloid impression materials that cannot be returned from a gel to original state by any practical means].

Debra Sawhill
Diversified Health Occupations
Portage Lakes Career Center

Demonstrating Math Skills and Principles

For students in health services who need help in becoming accustomed to metric measurements, simple demonstrations could involve transferring liquids from containers students are familiar with (e.g., quart bottle) into metric containers (e.g., liter bottle).

I find my students react very well to a demonstration/discovery approach. Their interest and motivation are already peaked before we hit the "paper" work, and they have already begun using vocabulary related to the concept before encountering it in a textbook setting.

Caryn H. Jackson
Mathematics/Science
Tolles Technical Center

Likewise, students could be asked to empty the contents of common objects such as teaspoons and tablespoons and coffee cups into a container with graduated markings for cubic centimeters (cc). After they have determined each measurement, they could prepare a conversion chart. This would be useful in measuring patient intake & output results, which need to be charted using metric measures. Thus, students need to be able to quickly convert a cup of coffee into a metric intake measure.

Or students could be given some "medication" (e.g., water colored with food dye) and a 50 mL container and be asked to discover how many drops (or scant teaspoonsful or tablespoonsful) it takes to fill the container? They will thus begin to develop an ability to roughly estimate number of dosages contained in a given medicine container.

When teaching ratios and proportions, you could use problems from the health field such as calculating how much medicine to give a 150-pound woman if a patient should get 1 ounce of medicine for every 20 pounds of body weight (1 oz is to 20 lb as X is to 180 lb). Ratios and proportions are also used in computing drug dosages: ***the known unit on hand*** is to ***the known dosage form*** as ***the dose ordered*** is to ***the unknown amount to be given***. Other applications include blood pressure, height/weight, body mass index, fat %/calipers, and waist/hip ratio.

Metric Calculators
<http://www.worldwidemetric.com/metcal.htm>

Use Planning Tools That Support Integration

When you are building your unit and lesson plans, it is very easy to get caught up in the subject you love best—the one in which you are certified to teach—and to forget about integrating material from other classes into your plans. The planning checklist that follows can help you focus on ***integration*** in your plans by reminding you of all the categories to consider, all the intersections possible. Since instructional ***variety*** is one of the keys to lesson success, this form also reminds you to look at—and use—the many instructional/assessment strategies and resources available to you.

Integration Planning Checklist

Lesson Topic: _____

For each of the following five focus areas, check all responses that apply.

Skills/concepts from which of the following areas can be presented/reinforced in this lesson?

- ☐ Applied Communications
- ☐ Applied Mathematics
- ☐ Applied Science
- ☐ Technology Literacy
- ☐ Employability Skills
- ☐ Teamwork
- ☐ Professionalism
- ☐ _____
- ☐ _____
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- ☐ Nurse Assisting
- ☐ Medical Assisting
- ☐ Patient Care Technician
- ☐ Medical Lab Technician
- ☐ Practical Nursing
- ☐ Dental Assisting
- ☐ Dental Lab Technician
- ☐ Optical Services
- ☐ Pharmacy Assisting
- ☐ _____
- ☐ _____
- ☐ _____
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- ☐ _____
- ☐ _____
- ☐ _____

Applicable Instructional Strategies/Activities:

- ☐ Demonstrations
- ☐ Lectures/Illustrated Talks
- ☐ Projects
- ☐ Portfolios
- ☐ Scenarios
- ☐ Case Studies
- ☐ Workplace Simulations
- ☐ Thinking Strategies (Metacognition)
- ☐ Problem Solving
- ☐ Decision Making
- ☐ Discussion
- ☐ Brainstorming/Buzz Groups
- ☐ Discovery Method
- ☐ Role-Playing
- ☐ Team Teaching
- ☐ Field Trips
- ☐ Guest Speakers
- ☐ Mentoring
- ☐ Teamwork
- ☐ Computer-Aided Instruction
- ☐ Interviews/Surveys
- ☐ Community-Based Activities
- ☐ Research/Independent Study
- ☐ Laboratory Activities
- ☐ Drill/Practice
- ☐ Games
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Applicable Instructional Resources:

- ☐ Vocational Texts
- ☐ Applied Academics Texts
- ☐ Authentic Materials
- ☐ Journals
- ☐ Newspapers
- ☐ Word Processing Software
- ☐ Communications Software
- ☐ Internet
- ☐ CD-ROM
- ☐ Videotapes
- ☐ Audiotapes
- ☐ Films
- ☐ Overhead Transparencies
- ☐ Handouts
- ☐ Models
- ☐ Real Objects
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Applicable Assessment Strategies:

- ☐ Objective Test Items (e.g., multiple-choice, true/false)
- ☐ Open-Ended Test Items (e.g., essay, short answer, oral)
- ☐ Performance Assessment
- ☐ Performance Checklists
- ☐ Rubrics
- ☐ Portfolio Assessment
- ☐ _____
- ☐ _____

Assessors To Be Used:

- ☐ Vocational/Tech Prep Teacher
- ☐ Applied Communications Teacher
- ☐ Applied Mathematics Teacher
- ☐ Applied Science Teacher
- ☐ Student (self-assessment)
- ☐ Peers
- ☐ Representatives from Business, Industry, and Labor
- ☐ _____
- ☐ _____

Fairfield Career Center
Teaching Team

Anne Conner, Allied Health

Larry Friend,
Applied Science/Mathematics

Shelley Hurst,
Applied Mathematics

One teaching team used the following format to coordinate team lessons from week to week. The plan can also include other subjects (e.g., applied communications, social studies).

Science	Math	Lab
Body Planes	Intro to Metric Conversions	Intro to Health Care Instruction Linens Terminal Cleaning
Systems Cells	Measurements • Household • Apothecary	Medicine/Nursing Hand Washing Bed Making
Bones	Area/Perimeter Linear Measure	Safety • Fire • Tornado Body Mechanics
Muscles Joints	Decimals, Fractions, Percentages Ratios, Proportions	Safety: Transportation Infection Control
Lymphatics	Word Problems Weight Conversions	Infection Control Isolation
Body's Reaction to Disease	Solving Equations with One Variable	Communication • Telephone • Call Light
Heart & Lungs	Graphing (line of best fit)	VS/TPR/WT
Fair Week	Lab Activities	Fair Week
Skin	Graphing Vitals Computer Programs	VS BD

Devise Joint Plans with Other Teachers

Teaching teams contributing to the Ideabooks spent time developing lesson plans tying the world of the classroom to the world of work. Some of these plans involved blending authentic experiences into the applied academics classes. Some involved joint activities between the vocational teacher and one or more academic teachers.

On the following pages, you will find a sample planning format, a blank form, and examples of the plans that were produced.

According to a report prepared by Brett Dickey for a teaching team from EHOVE Career Center (Milan, Ohio)—

> The greatest obstacle to the integrated lessons came from the students. They are very much indoctrinated into the system of having their subject matter divided into very distinct units of time. It took them some time to get used to the idea that they were to work on the same project in more than one of their classes. It was not unusual to hear them complaining, saying things like, "Why do we have to do that now? That's what we worked on in math today" or "That's for welding class, not communications class." However, once they adapted to the idea that their work in three classes was to center around a single project, the work improved, and complaints were heard less often. Some students even said that they wished more of what they were taught were presented in this format.
>
> One of the strengths of the integrated lessons was the constant reinforcement and feedback that students received. The teachers were able to communicate more effectively with the students since they were aware of what was going on in the other classes. This served to keep students on task since everything they did centered around one project.

Sample Format

In the sample format shown below, italics indicate the directions for completing each section.

Occupational Area: *e.g., Allied Health, Diversified Health Occupations, Patient Care Technician, Dental Assisting, Medical Technologies*

Academic Area: *e.g., Applied Communications or Mathematics or Science*

Activity Topic / Skill Area: *e.g., Prepare budgets*

Description of Workplace Context: *This should NOT be simply a repeat of the Activity Topic / Skill Area, nor should it be school-based. In other words, DON'T just say, "Workers need to prepare budgets," or "It is very important to prepare budgets." Instead, explain WHY it is important.*

This section should answer the student's eternal question, Why is this important to me in real life? It should focus on what workers do, and it should explain in more detail how the topic/skill is actually used on the job (e.g., in what situations, under what conditions?). It should also explain why the skill is particularly important—if it is (e.g., what could happen if the worker doesn't possess this skill or doesn't perform it well?).

Description of Related Classroom Activity: *This section needs to provide a clear, detailed, step-by-step explanation of the activity. It should be written so that an applied academics teacher who knows little or nothing about the occupational area could actually present the activity.*

Materials / Equipment: *Just list the major ones.*

Estimated Time Required: *e.g., four 50–minute periods*

Extended Activity: *This section should provide creative, challenging ways in which the students can pursue the lesson topic in more depth or breadth.*

Authors: *List each teacher, subject area, and the school.*

Hint: To be able to share your plans with others, you need to provide sufficient detail so that it will make sense to someone else. If another teacher cannot replicate the lesson because you have failed to include full explanations or complete information, the plan is not helpful.

Integrated Vocational-Academic Lesson Plan

Occupational Area:

Academic Area:

Activity Topic / Skill Area:

Description of Workplace Context:

Description of Related Classroom Activity:

Materials/Equipment:

Estimated Time Required:

Extended Activity:

Authors (name, teaching area, school):

Health Services

Occupational Area: Dental Assisting

Academic Area: Applied Science

Activity Topic / Skill Area: Dental Forensics

Description of Workplace Context: Dental forensics (bite-mark analysis) can be helpful in establishing the identify of a homicide victim or in linking a suspect to a crime. Everyone's teeth are different, and most people have a dental record. Thus, teeth are actually a better identifier than fingerprints because many people have never been fingerprinted. This activity also reinforces the importance of exact record keeping in the dental office.

Description of Related Classroom Activity: In science class, each dental assisting student will create and analyze his/her own bite mark and record information about it, as follows:

- Fold piece of carbon paper in half, carbon side out. Fold piece of white paper in half. Place the carbon paper inside the white paper.
- Bite down on the paper to make a bite-mark impression. Throw away the carbon paper and spread the white paper to dry. For safety/hygiene purposes, wait 2 or 3 days before using the bite-mark samples so the saliva can dry completely.
- Analyze own bite mark, and record information about it on a diagram. For example, if there is a broken central incisor, draw a broken central incisor on the diagram. Each individual tooth can be labeled and identified. When the student is finished drawing details on the diagram, it should look very similar to the bite mark.

Students can then compare their bite-mark diagrams to verify how different they are and how useful they would be in identifying individuals.

Materials / Equipment: 6cm x 12cm white paper and carbon paper

Estimated Time Required:

- Day One: 20 minutes
- Day Four: 40 minutes

Extended Activities: An outside expert, such as a police investigator, could be brought in as a guest speaker to talk about dental "fingerprints" and their use in actual cases. Students could also conduct research to identify cases that were solved using dental records and share their findings in reports to the class. A reading list of mystery authors featuring dental sleuths and mystery novels involving dental forensics could also be compiled, either by the teacher or the students.

Author: Phyllis Randall, Applied Science; Licking County Joint Vocational School

Occupational Areas: Dental Assisting, Computer Networking Applications

Academic Areas: Applied Science, Applied Communications

Activity Topic / Skill Area: Research on the Dangers of Fads Such as Tongue and Facial Piercing

Description of Workplace Context: Educating patients about practices that are harmful is an important part of dental assisting.

Description of Related Classroom Activity:

- Dental Assisting: Students studied the names of the teeth and facial bones.
- Applied Science: Students studied the cranial nerves and created posters showing where they are located in the mouth and face.
- Applied Communications: First, incorporating the knowledge gained in science and lab classes, students researched the harmful effects of facial piercings using trade journals, newspaper articles, brochures obtained from dental offices, and the Internet.

  Next, students from the computer networking applications (CNA) lab visited the applied communications classroom for 3 days to instruct the dental assisting students in how to create and run a PowerPoint® presentation. The CNA students created short assignments for the dental students for which they received presentation credit in their business classes. (An applied communications teacher with knowledge of PowerPoint could elect to teach the students him/herself.)

  Once students had mastered PowerPoint sufficiently, they each organized the information from their research into a PowerPoint presentation. Many chose to add photographs downloaded from the Internet. Others used the posters they had created in science class to enhance their presentations. Still others either scanned images or incorporated images from a digital camera.

  After the presentations had been completed and edited, students presented their research to students in other English classes.

Materials / Equipment: Computers, presentation software (e.g., PowerPoint)

Suggestions: In order to make the PowerPoint creation process go more smoothly in the future, it would help to have students submit index cards containing their proposed slide information before they actually begin using the computers.

Authors: Amy Gibson, Applied Communications; Susan Steinman, Dental Assisting; Phyllis Randall, Applied Science; Licking County Joint Vocational School

Occupational Area: Health Care

Academic Areas: Applied Math, Applied Communications

Activity Topic / Skill Area: Effects of Smoking on Health and Body Systems

Description of Workplace Context: Health services personnel—and the clients/patients they serve—need to be aware of the effects of smoking on the body and on health in general. By measuring their own responses to basic health care questions and the results of simple respiratory tests, students will benefit from a better understanding of how smoking can affect everyone, including nonsmokers.

Description of Related Classroom Activity:

For this activity, you could conduct a national campaign personalized for your own campus/student body. This can be any platform related to behaviors, social standards, reforms, etc. We chose an antismoking platform simply because, in our school setting, it is one of the problems that we deal with on a regular basis. Teenage smoking affects everyone in our school as the majority of students are smokers. We also have a high record of discipline problems that stem from their smoking habits. We chose to participate in the National "Kick Butts" Day on April 14, 1999, and expanded this activity into a Health Care Smoke-Out Week.

Relevant Websites such as the following were visited to determine guidelines for conducting a national Smoke-Out Campaign and to learn state-specific tobacco facts:

<http://www.tobaccofreekids.org>

<http://www.kickbuttsday.org>)

<http://www.cdc.gov/nccdphp/osh/data.htm>

These guidelines were used to structure the activities carried out in the various classes.

- Health Care: Students performed random respiratory tests (before-and-after pulmonary function tests) on student/staff populations and documented their findings.
- Applied Communications: After receiving instruction on how to construct and conduct a valid survey, students carried out research; conducted debates on selected issues concerning smoking and the tobacco industry; and used their findings to produce and administer a survey on smoking habits. In addition to asking for demographic data about the respondent (gender, age, year in school, program area, home school, whether employed or not), students included the following questions and response options on the survey (see next page).

- ✓ At what age did you begin smoking? (8-10, 11-13, 14-16, 17+)
- ✓ How long have you been smoking? (6 mths or less, 1 yr, 2-5 yrs, 6+ yrs)
- ✓ How many smokers are there in your home, including yourself? (1-3, 4-6, 7+)
- ✓ How often do you smoke? (once a week, once a day, multiple times daily)
- ✓ How many cigarettes do you smoke in a day? (0-3, 4-7, 8-10, 11+)
- ✓ Do your parents know that you smoke? (yes, no)
- ✓ Do they approve? (yes, no, do not care)
- ✓ How did you get started smoking? (peer pressure, stress, experimental/curiosity, parents smoke, other)
- ✓ How does stress affect your smoking? (a lot, a little, not at all)
- ✓ How does peer/social pressure affect your smoking? (more with friends, less with friends, does not affect)
- ✓ What is your reason for smoking? (friends, it makes me look cool, cannot quit, other)
- ✓ When do you smoke (check all that apply)? (right when I wake up, after breakfast, before lunch, after lunch, before dinner, after dinner, before going to bed, all day)
- ✓ Do you use alcohol? (yes, no)
- ✓ Do you use drugs? (yes, no)
- ✓ How does your drug/alcohol use affect your smoking? (smoke more, smoke less, does not affect)
- ✓ What brand of cigarettes do you smoke? (Marlboro, Camel, Newports, Winston, other)
- ✓ What price do you pay per pack? ($1.00–$1.49, $1.50–$2.00, $2.01–$2.50, other)
- ✓ How much money do you spend on cigarettes in one week? ($0.00–$2.00, $3.00–$10.00, $11.00–$15.00, $16.00 or more)
- ✓ Where do you get your cigarettes? (gas station, store, friends, parents, other)
- ✓ How do you get your cigarettes? (purchase them myself, steal them, friends purchase them, family members purchase them, other)
- ✓ How has smoking affected your health? (not at all, slightly, noticeably, extremely)

- ✓ In what ways has smoking affected your health (check all that apply)? (weight gain or loss; skin, nail, or hair problems; trouble breathing; chest pain; cardiovascular or respiratory disease; more colds and/or sinus or ear infections; dental problems; trouble sleeping; loss of energy; other)
- ✓ How has smoking affected you financially? (has not affected me, slightly, spend all my money on my habit)
- ✓ How has smoking affected your social relationships? (gained friends, lost friends, gained loved ones, lost loved ones, not at all, other)

• Applied Mathematics: Students tabulated the data collected, did "number crunching," determined percentage of smokers and nonsmokers, and created statistical graphs and correlations (charts) on the cost-effectiveness of smoking versus nonsmoking.

Materials / Equipment: Materials provided by the national campaign (posters, fliers, and prizes), survey materials, online services, library facilities, calculators, and spirometer for measuring lung capacity

Estimated Time Required: One week minimum

Lesson Results: This proved to be a successful venture—both educationally sound and fun. It really did create an awareness of the benefits of not smoking. Some students actually stated that it helped them to reach a decision not to smoke. Prizes were awarded to the teacher and students with the "best lungs" and for participation and attitude. Information concerning the benefits of not smoking was included on the morning announcements. We suggest using this campaign as well as the American Lung Association's No Smoke Day in November. The key is communication between participating teachers and students. We felt that the whole staff and student body were aware of our efforts and that they participated in a very positive manner.

Authors: Debra Sawhill, RN, Health Care Technician Program; Kathy Subity, Applied Mathematics; Marlana Marquess, Applied Communications; Portage Lakes Career Center

Occupational Area: Health Care

Academic Areas: Applied Mathematics, Applied Communications

Activity Topic / Skill Area: Development of Student Wellness: Improving Nutrition

Description of Workplace Context: One purpose of this activity was to help future health care workers understand how nutrition affects their moods, behavior, and performance. In addition, we were attempting to identify student opinion concerning our current lunch program, which consists of vending machines supplemented by French fries or pizza purchases.

Description of Related Classroom Activity:

In the first part of this activity, an initial survey of volunteers from the student population was conducted. These students were asked, What do you eat? Students then agreed to eat well-balanced meals and to chart in a diary what they ate over a 72-hour period, as well as any changes in mood or energy level. They also agreed to use no drugs or alcohol during the 72-hour period. The diaries were used in the various classes to create an awareness of the need for adequate nutrition.

- Health Care: Students checked for mood and behavior changes, energy and general well-being, agility and target heart rates at different intervals.
- Applied Communications: Students checked for changes in reading comprehension as a result of eating well-balanced meals.
- Applied Mathematics: Students checked reasoning skills using logic problems. They summarized findings (number crunching of data) and did lab work on caloric values.

In the second part of this activity, students conducted a student opinion survey related to our current lunch program.

- Health Care: Students looked at overall nutritional status and food pyramid guidelines as baseline information on which to judge the current lunch program offerings.
- Applied Mathematics: Students applied percentages to fat grams, carbohydrates, protein, and calories.
- Applied Communications: Students wrote a paper summarizing the results of the opinion survey and their research (a persuasive paper to the superintendent concerning needed changes in the school lunch program).

Materials / Equipment: Overhead transparency with food pyramid guidelines, survey form, and nutritional diary handout

Estimated Time Required: 72 hours

Lesson Results: By keeping a record of what they ate and how it affected their performance, students were able to see a connection between good nutrition and ability. We were also able to create a platform for students to express their opinion about the current lunch situation to the administration and school board, thus using their problem-solving and conflict resolution skills. The response to the opinion survey concerning school lunches was an overwhelming call for change. Suggestions gathered by students were forwarded to the principal, who will be discussing options for healthier lunches with our superintendent. We were not able to get to the level of the school board as originally planned. However, the whole process seemed to empower our students as they learned about political voice and the chain of command.

Extended Activity: Prepare a final presentation for a school board meeting.

Authors: Debra Sawhill, RN, Health Care Technician Program; Kathy Subity, Applied Mathematics; Marlana Marquess, Applied Communications; Portage Lakes Career Center

Occupational Area: Health Care

Academic Areas: Chemistry, Communications, Mathematics

Activity Topic / Skill Area: Designing an Appropriate Diet

Description of Workplace Context: Health care today focuses on wellness and prevention of disease. Proper nutrition is a key component in living healthier lives, and health care professionals must be able to discuss healthy, nutritional choices with patients in all stages of life and suffering from various diseases.

Description of Related Classroom Activity:

- Health Occupations: Students will learn to classify foods according to the food guide pyramid and select appropriate foods for both healthy individuals and those with specific dietary requirements.
- Chemistry: Students will use reagents to test for the presence of protein, lipid, and carbohydrate in various food items.
- Communications: Students will keep a 7-day journal in which they will note all food and drink consumed, serving size, and where and when each item was consumed. They will also categorize each item according to food groups.
- Mathematics: Each student will review the data in his/her own journal and calculate the following: total number of calories consumed; daily average; and percentage of calories consumed in carbohydrate, lipid, and protein. Given standard data for the appropriate number of calories based on age, gender, and activity level, students will evaluate their own diets in meeting these requirements.

Materials / Equipment: food guide pyramid model with food samples, food labels, chemical reagents, calculators

Estimated Time Required: nine 50-minute class periods

Extended Activities:

- Students could interview hospital or nursing home dietitians regarding the types of foods included in various controlled diets.
- Students could create a food guide pyramid bulletin board for the school.
- Students could create a flyer about the food guide pyramid and the requirements for a healthy diet for sixth grade visitors to the class.

Authors: Sheila Oehler, Chemistry; Phyllis Rose, Mathematics; Robin Schoonover, Health Occupations; Buckeye Hills Career Center

Occupational Area: Health Services (Allied Health)

Academic Areas: Mathematics, Science, Communication

Activity Topic / Skill Area: Study of Effects of Cleanliness on Attendance Rates

Description of Workplace Context: Health care providers must be aware of surface areas that might spread infection through direct contact. Hand-washing technique is the most important procedure used to prevent the spread of infection. Teaching others personal cleanliness can cut the spread of infection.

Description of Related Classroom Activity: Attendance is a problem for most schools. By looking at the previous year's attendance records, developing and implementing a plan to improve surface cleanliness, and evaluating the results in terms of effects on current attendance data, students are introduced to research and its many important skills. The scope for the project—whole school, one program, a single class—can be made to fit any school. The Tech Prep team at Fairfield Career Center plans to involve the entire school.

- Vocational Laboratory: The three health occupation programs will divide the cleaning chores. Each Friday, they will visit each lab and academic classroom to surface-clean desks, doorknobs, and phones. They will clean the faucets in all bathrooms. The maintenance department will supply cleaning materials. Students will perform concurrent cleaning, practice proper hand-washing technique, practice personal hygiene, analyze the effects of absenteeism on quality of client care and staff morale, and demonstrate knowledge of modes of transmission and chain of infection.
- Mathematics: Students will obtain and organize attendance records for the previous year; determine the factors used (e.g., program, gender, home school); analyze and interpret the data; create graphs to represent their findings; and manipulate formulas (growth multiplication, exponentials) related to the data. Attendance data will then be analyzed at the end of each quarter to determine whether there is a statistically significant change in attendance rates as a result of improved surface cleanliness.
- Science: After studying the parts of a microscope and learning how to create a slide of a culture medium, students will practice scientific inquiry (state problem, gather information, plan solutions, implement solutions, evaluate solutions) in relation to surface cleanliness. They will culture common surfaces in the school, such as desks, doorknobs, sink faucets, and phones; make slides of the microorganism's growth; focus and study the slides using a microscope; and report the results.

- Communication: Students will create posters designed to teach proper hand-washing techniques and place them in all restrooms. At the end of the study, students will organize all information and present a report on their findings to the administration. This will also involve students in writing and organizing directions and identifying key ideas.

Materials / Equipment:

- Vocational: cleaning supplies
- Mathematics: computer access
- Science: microscopes, culture media, slides
- Communication: poster board, magic markers

Estimated Time Required: Time is flexible: can be spread out over the whole school year or limited to a single grading period.

Extended Activity: Have students demonstrate proper hand-washing technique to students in other classes.

Authors: Anne Conner, Allied Health; Larry Friend, Science; Shelly Hurst, Mathematics; Fairfield Career Center

Occupational Area: Health Services (Nursing)

Academic Areas: Applied Mathematics, Applied Science, Applied Communications

Activity Topic / Skill Area: Proper Hand-Washing Techniques

Description of Workplace Context: Sanitary conditions are essential in a variety of laboratory and life situations to prevent the spread of disease and infection.

Description of Related Classroom Activity: The following activities will demonstrate to students the prevalence of many types of bacteria, why this information is important, and how they can reduce or eliminate most bacteria.

- Science: During science class, nursing students will visit a variety of vocational labs (nursing, early childhood education, cosmetology, food service) and explain the importance of sanitary conditions. They will then perform a scratch test on the hands/nails of all students in the lab and place each sample in a labeled petri dish. After demonstrating correct hand-washing techniques, they will ask participants to wash their hands/nails. The scratch tests will then be performed again, and the samples will be put in clean, labeled petri dishes. Finally, the nursing students will perform scratch tests on equipment, countertops, water coolers, rest rooms, and door handles in the area.
- Mathematics: After allowing the appropriate gestation period, students will calculate the amount (percentage) of bacteria present in each sample and compare it to acceptable ranges. Comparisons between samples taken before and after hand-washing will also be stated mathematically.
- Communications: Students will receive instruction on the scientific research method format and will use that format to write up their findings. This information will then be shared with participants. Data can be presented to each individual concerning the results of his/her pre/post-hand-washing scratch tests; however, data presented to all participants should summarize group results and should not name names.

Materials / Equipment: cotton swabs, petri dishes and labels, activating agent agar (liquid nourishing agent), calculators, range chart

Estimated Time Required:

- Four 40-minute class periods to gather the samples
- One 40-minute class period to calculate and interpret the results
- Three 40-minute class periods to write up their findings
- Four 20-minute sessions to present their findings and recommendations to participants

Extended Activity: Nursing students will periodically conduct follow-up research in the identified lab areas (e.g., two more times throughout the school year). They may also continue this research at home or at their job sites.

Authors: Jeanie Blake, Licensed Practical Nursing; Connie Hilty, Applied Communications; Kenneth Kroah, Mathematics/Science; Muskingum-Perry Career Center

Occupational Area: Health Services

Academic Areas: Applied Communications, Applied Mathematics, Applied Science

Activity Topic / Skill Area: Use of Mnemonic Devices in Learning Anatomy

Description of Workplace Context: There is a good deal to remember on the job. Knowing how to make up and use mnemonic devices makes remembering easier (and fun).

Description of Related Classroom Activity: Provide instruction about what mnemonic devices are, why they are useful, and how to create them. Then provide some samples related to anatomy. For example:

- To remember the six components of the endocrine system (thyroid gland, parathyroid glands, thymus gland, adrenal glands, pancreas, and gonads), think—

  Toast, pickles, tomatoes are pretty good.

- To remember the facial muscles (buccinator, orbicularis frontalis, orbicularis aculi, oris, and zygomaticus), think—

  Frank owns beagles, ostriches, and zebras.

Then as additional anatomical groups (bones, muscles, organs) are introduced and studied, have students (individually or as a group) make up their own mnemonic devices to remember each group.

Authors: Kenneth Kroah, Mathematics/Science; Connie Hilty, Applied Communications; Jeanie Blake, Practical Nursing; Muskingum-Perry Career Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Areas: Science and Mathematics (see correlated plans, which follow)

Activity Topic / Skill Area: Anatomy and Physiology of Systems: Body Systems & Related Diseases

Description of Workplace Context: All allied health professionals need an accurate knowledge of the anatomical structures of the various body systems. Each client presents his/her symptoms in a unique manner. The professional must take the symptoms and match them to the system involved and carry out the proper treatment to aid in improving the client's condition. The health care professional must also use available technology (computer, Internet, fax, etc.) to communicate with the health care team in order to offer complete and accurate care.

Description of Related Classroom Activity: A critical job skill is the ability to aid the physician in diagnosing/treating an illness based on the objective and subjective findings in an exam. Thus, instruction focuses on the identification of parts and functions of all body systems, diseases affecting those systems, and matching the appropriate allied health profession to the treatment modality. Employability knowledge will be gained as students research the professions that treat each body system.

In the vocational classroom/lab, the students are introduced to the body systems using overheads, textbook illustrations, handouts, and the ADAM interactive software package. Proper medical terminology is presented as well. Students are then required to identify the anatomical parts of each system, match the disease to the system, and discuss the role of each allied health professional in the treatment of each disease.

Materials / Equipment: Handouts, worksheet, anatomy model, overhead transparencies, ADAM software package, computer with OCIS (Ohio Career Information System) and Internet access for employability information

Estimated Time Required: One month of lab time to cover body systems and diseases and to conduct the research on allied health professions

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Area: Science: Anatomy and Physiology

Activity Topic / Skill Area: Anatomy and Physiology of Systems: Use of Charts & Graphs, Research on Diseases of a System, and Terminology

Description of Workplace Context: The study of human anatomy and physiology is vitally important in all health science professions since they involve the prevention, diagnosis, and treatment of disease processes. Because diseases disrupt the normal operation of the body, it is necessary to understand how a healthy body functions.

Description of Related Classroom Activity: This project is assigned during the month when students are also studying body systems in their vocational lab (see previous related plan). In science class, students work in small groups, with each group assigned a different body system to research. In their research reports, students must do the following:

- Name the components of the system
- List the purpose(s) of the system
- Describe the functions of the system
- Define terms associated with diseases of the system
- Relate medical terms and diseases of the system
- Include charts and graphs associated with the system

The research results are presented by each group to the class. Presentations should include a visual element, such as a project board.

Materials / Equipment: Internet access, resource materials, computer, project board, ADAM software package

Estimated Time Required: Actual classroom time needed is between 8-10 hours. Students are given some class/library time to do their research and to type and compile their data, and some of the work must be done outside of class. The actual projects are due 3–4 weeks after they are assigned.

Extended Activities: The knowledge gained will be helpful in the students' vocational lab and can be used as a basis for an individualized project for the annual math/science fair. The finished student projects may also be used to create a learning center in the classroom to provide reteaching, remediation, or extra help for students that need more practice in understanding the body systems.

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Area: Mathematics

Activity Topic / Skill Area: Anatomy and Physiology of Systems: Measurement, Percentages, Statistical Analysis Graphs

Description of Workplace Context: When a patient undergoes a procedure requiring rehabilitation of any kind (physical therapy, bed rest, diet, etc.), his or her progress must be monitored statistically and charted. This is often done by the health care professional so that a doctor can examine the statistical data as the patient is being examined. The same is true when a patient is diagnosed with a degenerative or long-term disease. Gathering and charting data is an essential skill for nurses, physical therapists, and many other health care specialists. This unit concentrates on general statistical analysis, followed by application through a research project on physical therapy, population data, and/or use of published research statistics on degenerative diseases or other medical data.

Description of Related Classroom Activity: The study of statistical analysis begins with information about the normal curve and examination of generic data. Students construct histograms based on the data, including calculation of mean, median, mode, standard deviation, range, minimum, maximum, class intervals, and class interval frequency. Class discussion revolves around the question, What is normal? Should medical data follow the normal curve, should it be one-sided, or should there be no variation at all? Which types of medical data fit each category mentioned?

Example:

- Normal Curve: growth and vital statistics for a vast population, blood sugar levels, etc.
- One-Sided: evolution of a cyst or tumor, effects of degenerative disease, physical therapy, etc.
- Little to No Variation: statistics indicating good health, a disease in remission, etc.

Students construct charts based on generic data to examine how statistics can be used to monitor a situation and catch a potential problem before it is beyond control. This exploration will be a brief activity involving construction of line, bar, and pie graphs. (See sample problems, which follow.)

The unit concludes with application through projects. Student project options include the following:

- Gather and chart vital statistics from the school's population.
- Research and chart statistics gathered from published studies on the degenerative effects of a disease.
- Research and chart statistics gathered from any published medical study.
- Monitor the rehabilitation of a student, staff member, or family member after a procedure or through physical therapy, and chart the progress.

The class is divided into small groups (2–3) to conduct the projects. The projects do not receive daily class time but will involve periodic class time over a long period. Students present their projects to the other groups upon conclusion. Any student choosing to work alone is eligible to enter his or her work in the annual math/science fair.

Materials / Equipment:

- Generic data for use in constructing histograms and charts (Recommended text: Robert T. Amsden, Howard E. Butler, David M. Amsden. *SPC Simplified: Practical Steps to Quality*, 2nd ed. Productivity, 1998.)
- Any device used to monitor medical statistics: blood sugar tests, stethoscope, sphygmomanometer, scales, etc.
- Scientific calculator capable of generating statistical data
- Measurement tools for physical therapy, including the means to measure length and angles
- Access to medical journals via hard copy or Internet
- Graphing calculator or computer lab with spreadsheet and/or a statistical math package (e.g., DERIVE) for extended activity

Estimated Time Required: 7.25 hours of class time, as follows:

- Normal curve and histograms: 120 minutes
- Charts & graphs: 90 minutes
- Project time: 80 minutes of periodic class time, with the rest to be conducted outside of class
- Presentation time: 45 minutes

Extended Activities:

- Students could apply their knowledge to conducting an individualized project for the annual math/science fair.
- A guest speaker could be brought in to demonstrate charting and evaluation of vital patient data.
- Students could use a graphing calculator or a computer with a spreadsheet or math package to investigate data graphically and generate graphs and histograms. Linear regression could be investigated and studied by students having a solid algebra/ geometry background.

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Sample Problems

1. A man who has had arthroscopic surgery on his knee to repair ligament damage and to clean bone and tissue buildup behind the knee cap is coming to your center for physical therapy. The man cannot fully straighten his knee. You have charted the following measurements on his progress:

Prior to surgery:		121°
Post surgery:	Day 1:	131°
	Day 5:	140°
	Day 9:	152°
	Day 13:	165°
	Day 17:	172°
	Day 21:	177°
	Day 25:	180°

Make a line graph to show the patient's progress through physical therapy.

2. A child is under your care at the hospital. The following temperatures have been charted:

2:00	102.9°	2:30	103.2°	3:00	103.5°
3:30	104.1°	4:00	104.5°		

The patient is given a medication to reduce the fever rapidly. You take the following temperatures:

4:30	102.3°	5:00	101.9°	5:30	99.2°

Create a line graph depicting the fluctuation in temperatures.

3. Nearly 40 million Americans have arthritis (1 in 7). About 6 million Americans are self-diagnosed and have not yet seen a physician to be sure. Nearly 23 million women of all ages have arthritis. Arthritis has caused disability in about 7 million Americans. The estimated annual cost of arthritis to the economy is $54.6 billion in medical care and indirect costs such as lost wages. For the following activities, assume the population of the United States is 280 million.
   a. Make a pie graph depicting total population, men with arthritis, and women with arthritis.
   b. What percentage of Americans with arthritis are estimated to be self-diagnosed?
   c. Make a pie graph depicting Americans with arthritis who are disabled versus those who are not.
   d. What is the average cost per American with arthritis?

4. Cardiovascular disease (CVD) is the number one cause of disease-related mortality. The following table depicts the mortality trend in the U.S.:

Year	Males	Females
1979	500,000	470,000
1981	500,000	481,000
1983	499,000	492,000
1985	490,000	499,000
1987	478,000	502,000
1989	452,000	480,000
1991	444,000	480,000
1993	460,000	500,000
1995	458,000	503,000

Make a line graph depicting the variance in CVD mortalities between men and women over this period of time.

5. Approximately 58,800,000 Americans have one or more types of CVD. Use the following break-down to construct a pie chart:

High blood pressure 50,000,000
Coronary heart disease 12,000,000
Myocardial infarction 7,000,000
Angina pectoris 6,200,000
Stroke 4,400,000
Rheumatic fever/rheumatic heart disease 1,800,000
Congenital cardiovascular defects 1,000,000
Congestive heart failure 4,600,000

6. In 1996 the following percentages of CVD occurrence resulted in mortality:

Stroke 16%
Rheumatic 1%
Congenital defect 1%
Atherosclerosis 2%
Congestive failure 4%
High blood pressure 4%
Coronary heart disease 50%
Other 22%

Illustrate those data using a pie chart.

7. In 1996, CVD claimed 959,227 lives (453,297 male; 505,930 female), with 2,316,973 deaths reported. What percentage of the deaths were caused by CVD?

   More than 2,600 Americans die each day of CVD. This is one person every ___ seconds.

   In 1996, the other leading causes of death were as follows:

   Cancer 544,728
   Accidents 93,874
   HIV 32,655

   Make a pie chart depicting the data on leading causes of death in 1996. Include five categories: CVD, Cancer, Accidents, HIV, and Other.

8. Compile a chart of data for a sampling of 100 students and staff. The chart should have four columns: patient #, systolic, diastolic, and pulse rate. Note age range of sample. Using the data on the chart and medical statistics from the Internet (see below), answer the following questions:

   a. Are these data normally distributed?
   b. Does this surprise you? Why or why not?
   c. What factors could skew the data?
   d. How could the sample be more tightly controlled?
   e. What changes would you expect under the tighter control?
   f. Sketch the ideal distribution for the data (3 histograms).
   g. What factors could make a student's data fall in the high range?
   h. What factors could make a teacher's data fall in the high range?
   i. What factors could make any patient's data fall in the high range?
   j. Does this sample provide an accurate snapshot of data for the entire school? Why or why not?

   Closure: What type of medical statistic would you most like to explore?

   Internet Sources for Medical Statistics:

   - National Cancer Institute: <http://www.nci.nih.gov>
   - Centers for Disease Control and Prevention: <http://www.cdc.gov>
   - American Heart Association: <http://www.americanheart.org>
   - Franklin Institute Science Museum: <http://www.fi.edu>
   - Colorado HealthNet: <http://www.coloradohealthnet.org>
   - National Foundation for Infectious Diseases: <http://www.nfid.org>
   - World Health Organization: <http://www.who.ch>
   - National Association for Public Health Statistics and Information Systems: <http://www.naphsis.org>

Health Services

Occupational Area: Medical Technologies (DHO)

Academic Area: Applied Science

Activity Topic / Skill Area: Sense of Sight, Cataracts, Patient Empathy

Description of Workplace Context: It is important for the health care provider to understand how a patient with eye complications experiences the world.

Description of Related Classroom Activity: After studying the eye, students work in pairs, with one student wearing goggles smeared with Vaseline to simulate eye complications, and the other student assisting the "patient" in performing various activities, such as doing a puzzle or coloring a picture.

Author: Bernadette Terry, Applied Anatomy and Physiology; Whitmer CTC (Toledo, Ohio)

Health Services

Occupational Area: Medical Technologies (DHO)

Academic Area: Applied Science

Activity Topic / Skill Area: Muscles / Occupational Therapy

Description of Workplace Context: Understanding how muscles and muscle pairs work to manipulate objects is very important to the occupational therapist.

Description of Related Classroom Activity: After studying the muscles in the hand, students work in pairs, with one student role-playing a patient with a hand injury, and the other student role-playing an occupational therapist. The hand injury can be simulated by taping a thumb to the hand or taping two fingers together. The therapist must aid the patient in various activities of daily living (ADL) such as brushing the teeth, buttoning a shirt, eating.

Author: Bernadette Terry, Applied Anatomy and Physiology; Whitmer CTC (Toledo, Ohio)

Occupational Area: Medical Technologies

Academic Areas: Applied Science, Applied Mathematics

Activity Topic / Skill Area: Acquiring, Organizing, and Interpreting Blood Work Data

Description of Workplace Context: Thinking skills are highly valued on the job. By knowing and following the scientific method of investigation, workers are involved in every step of data acquisition and actively apply their thinking skills.

Description of Related Classroom Activity:

- Applied Science: Students learn principles of antigen-antibody reactions related to ABO and/or Rh blood types. They then set up purpose, procedure, and data tables for a lab project.
- Medical Technology: Each student collects and types own blood, and then the class as a whole fills in the data tables. Another option would be involve a larger sample by conducting a schoolwide survey to determine the blood types of those students who know their type (e.g., through doctor's visits or bloodmobile donations). The survey could also request information about such factors as gender and ethnicity, so that data could be arranged to identify whether such factors affect the findings and, if so, how.
- Applied Mathematics: Students calculate the percentages of different blood types found and present this information graphically (using student-developed or computer-generated graphs/charts). This information can be compared to given percentages found in texts. The effects of factors such as race, gender, etc., can be compared as well.
- Applied Science: When the project is completed, students interpret the data, draw conclusions, and account for variables in data collection and variations from "normal" data.

Extended Activities: The activity can be repeated each year with different classes, with each new year's data compared to that of the previous year(s). At the same time, the total sample group keeps growing larger year by year.

Authors: Beth Armstrong, Medical Technologies; Kalyn Stichler, Applied Mathematics; Sandy Weaver, Applied Science; Pioneer Career and Technology Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Areas: Applied Math, Applied Science (see correlated plans, which follow)

Activity Topic / Skill Area: Disease & Pharmacology Intervention: Diseases & Treatment Modalities

Description of Workplace Context: Most clients are treated with medication at some time during the course of their treatment. Thus, all allied health professionals need an accurate knowledge of disease states and the correct use of medications as a treatment modality, including knowledge of drug classes, safe and accurate administration, mechanism of action, and possible side effects.

Description of Related Classroom Activity: In the vocational classroom/lab, students are introduced to the major diseases by body system. Using a worksheet, they fill in information related to each disease, such as organs affected, physical symptoms, treatment modalities with medications, type of medications, and side effects of those medications. Role-playing is utilized in an office scenario in which players are given an assigned illness and need to prescribe the proper treatment. Safety and the five "rights" of medications are stressed.

Materials / Equipment: Handouts, worksheet, anatomy model, role-play scenarios, lab equipment to simulate office setting, evaluation sheets

Estimated Time Required: Two weeks of lab time (24 hours) will be utilized, with two major diseases from each system introduced.

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Area: Science: Chemistry

Activity Topic / Skill Area: Disease and Pharmacology Intervention: Elements, Chemical Symbols, Atomic Models, Compounds, Chemical Equations

Description of Workplace Context: In the past, plagues or epidemics caused millions of deaths. Many of these diseases are now preventable, and technological advances are being used to provide better health care. In the U.S., the focus of health care has shifted from prevention of contagious or communicable diseases to those that may be the result of heredity and environment (e.g., cancer, drug dependency, and heart disease).

Description of Related Classroom Activity: The body is a complex chemical factory within which a variety of reactions take place that are integral to good health. When the body is not functioning properly, different chemical reactions occur that upset the delicate balance and result in the symptoms associated with various illnesses. An understanding of the chemical processes that occur in the body can help students in making diagnoses and responding appropriately.

- Activity 1: Definitions of atoms, elements, and compounds are presented to the class through notes and lectures, and students are shown how to diagram atoms using the Bohr model and the Lewis electron dot model. Students are then given a list of elements that are of particular interest to health professionals (e.g., calcium, phosphorus, magnesium, potassium, sodium, chlorine, iodine, and iron) and are asked to create a chart that includes the following:

  ✓ Name of each element

  ✓ Description of each element's importance and its function in the human body

  ✓ One health problem associated with a lack or overabundance of each element

  ✓ Chemical symbol for each element

  ✓ Drawing of the Bohr model and the electron dot configuration for each listed element

  An information-packed Periodic Table of the Elements / Atomic Number can be found at the following Website: <http://wulff.mit.edu/pt>.

- Activity 2: After teaching (or reviewing) how to balance a chemical equation, instruction focuses on the equation $HB + O_2 \Leftrightarrow HBO_2$ which represents oxygen attaching to a hemoglobin molecule. Lecture, notes, overhead transparencies, etc., are used to explain why oxygen is needed. Relevant vocabulary is defined (e.g., hemoglobin, oxyhemoglobin, deoxyhemoglobin). Students are then given the following health-related problem to solve and are asked to create a bar graph to compare the three blood hemoglobin levels given in the problem:

  For an adult male, a normal blood hemoglobin level is 14–16 g/100 mL blood. For an adult female, the normal level is 12–15 g/100 mL blood. If a pregnant patient's hemoglobin level were 8 g/100 mL blood, what would the condition be labeled? What would be the danger to this patient? What would be the danger to the developing fetus? What would be a possible treatment?

Materials / Equipment: Handouts, worksheets, periodic table, reference and resource material, Internet access/computer, poster board

Estimated Time Required: Teaching the overall topic—elements, chemical symbols, and atomic models—can be completed in a 2-week period. The actual time required to complete Activity 1 after the basic information has been covered should be two 90-minute periods, depending upon how many elements are assigned to each student or group of students. The teaching time required to cover compounds and balancing chemical equations is approximately 2 weeks. Activity 2 can be completed in one or two 90-minute classes.

Extended Activities:

- A nutritionist could be invited to come to class to discuss the importance of minerals and trace elements in the diet.
- Using reference books and Internet information, students could determine the percentage of the U.S. recommended daily allowances for the elements/minerals in Activity 1.
- Students could be asked to list the compounds from the labels of the containers in the medicine cabinet at home and then to write the chemical formulas for as many of these compounds as they can.

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Area: Mathematics

Activity Topic / Skill Area: Diseases & Pharmacology Intervention: Dosage Calculation, Preparation, and Administration

Description of Workplace Context: Health services professionals must be able to interpret the language of prescriptions, including units of measurement (metric, SI, apothecary, and household). They must know the difference between multi-dose packaging and unit-dose packaging. Drug preparations include oral, parenteral, and topical routes; and equipment used to measure dosages ranges from oral solids to medicine cups to syringes. Injections can be prepared from either liquid or powder form. In addition to knowing the appropriate measurement for each type of medication, health services professionals must be able to perform calculations related to intravenous fluids, including drip rates, number of hours an IV will run, and dosages of medication per hour. They must also be able to convert dosages from adult concentrations to concentrations for children and vice versa. Finally, they must be able to evaluate effectiveness, chart progress, and calculate error.

Description of Related Classroom Activity:

- Students first learn (or review) metric, SI, and household measurements through a brief lecture, discussion/notes, and practice. Students demonstrate their knowledge in a measurement lab activity, using various containers for evaluation.
- Next students learn additional metric prefixes not traditionally taught along with the apothecary system. Again, a brief lecture, discussion/notes, and practice are utilized, followed by a lab activity.
- Application is made to differing types of medication and administration routes. These applications involve real-world situations—small-group cooperative learning exercises completed in class, followed by individualized homework problems.
- Specialized lessons cover oral medications, liquids for injection, injections from powder, intravenous fluids, and dosages for infants and children.
- To conclude this unit of study, students learn to chart medications, evaluate their effectiveness, and calculate error in medication. This is done through a brief introduction by the teacher and a lab activity.

Materials / Equipment: Graduated containers, syringes, food coloring, saline, sugar, calculator, charts, IV

Textbooks:

- Bila, Dennis. *Mathematics for Health Occupations.* Instructional Technologies, 1986.
- Henke, Grace. *Med-Math: Dosage Calculation, Preparation, and Administration*, 3rd ed. Lippincott Williams & Wilkins, 1998.

Estimated Time Required: 27 hours of class time, as follows:

- Metric review: 90 minutes
- Lab activity: 90 minutes
- Nontraditional metrics and apothecary system: 270 minutes
- Lab activity: 90 minutes
- Specialized applications: 900 minutes
- Conclusion: 180 minutes

Extended Activities:

- Students can further investigate mathematics in pharmaceuticals by breaking down the percentages of ingredients in different over-the-counter medications. The teacher could collect box labels from various cold/flu/allergy medications, along with the weight of one dosage and the time between dosages. Students could then break down, by percentage, the amount of each ingredient in a single dosage, and the average amount of each ingredient released into the bloodstream per hour based on a single dosage.
- A guest speaker—doctor, nurse, or pharmacologist—could be brought in to address the procedures and methods of measuring and administering medicine.
- A field trip could be taken to, or job shadowing arranged with, a pharmacy or a pharmaceutical plant so that students could actively interact with people working in the industry.

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Occupational Area: Medical Technologies

Academic Areas: Applied Science, Applied Mathematics

Activity Topic / Skill Area: Pharmacology

Description of Workplace Context: People in medical professions need to be able to read and interpret a doctor's orders accurately and to calculate correct dosages of required medications.

Description of Related Classroom Activity:

- Medical Technologies: Students will study drug legislation, history of drugs, drug classifications, routes of administration, and terminology. They will also learn how to read a prescription.
- Applied Science: Students will learn about the theory behind muscle actions and reactions related to injections, chemical interactions, and the various forms of medications (liquids, solids, semi-solids, and gasses) and their characteristics.
- Applied Mathematics: Students will learn to use ratios, proportions, formulas for doses and dosages, Roman numerals, the metric system, the apothecaries system of measure, and the household-metric system of measure.

Extended Activity: Practice scenarios could be developed for the lab requiring students to read a prescription and dispense practice drugs correctly.

Authors: Sandy Weaver, Applied Science; Kalyn Stichler, Applied Mathematics; Beth Armstrong, Medical Technologies; Pioneer Career and Technology Center

Occupational Area: Nursing

Academic Area: Applied Mathematics

Activity Topic / Skill Area: Dosage Calculations

Description of Workplace Context: Nurses need to know how to calculate the proper dosage of medications in a variety of situations, whether it be an emergency situation or as a care giver in a nursing home. Those who cannot perform this skill will be considered a liability to health care institutions.

Description of Related Classroom Activity: The following three steps not only give students the proper way to calculate dosage but make them ***estimate*** a logical answer before they begin solving.

- Convert: Make sure all units are in the same system and the same size (e.g., milligrams, grams, milliliters).
- Think: Identify what a logical dosage would be. (This will minimize the potential for errors.)
- Calculate:

$$\frac{\text{Dosage on hand}}{\text{Amount on hand}} = \frac{\text{Dosage desired}}{\text{X amount}}$$

To solve this involves substituting the proper numbers and cross-multiplying.

Example One:

You've been ordered to give a patient 0.6 g P.O. (by mouth) of Motrin. You have available 300 mg tablets.

- Convert: 0.6 g = 600 mg (1 g = 1000 mg)
- Think: Logically, two of the 300 mg tablets would be needed (2 x 300 = 600).
- Calculate:

$$\frac{\text{Dosage on hand}}{\text{Amount on hand}} = \frac{\text{Dosage desired}}{\text{X amount}}$$

$$\frac{300\text{ mg}}{1\text{ tablet}} = \frac{600\text{mg}}{\text{X tablets}}$$

$$600 = 300 \cdot X$$

$$X = 600 \div 300$$

$$X = 2 \text{ tablets}$$

Example Two:

You've been ordered to give a patient Thorazine 15 mg IM Stat (intravenously). You have available 25 mg per ml.

- Convert: None needed.
- Think: Logically, you will need to give less than 1 ml.
- Calculate:

$$\frac{\text{Dosage on hand}}{\text{Amount on hand}} = \frac{\text{Dosage desired}}{\text{X amount}}$$

$$\frac{25 \text{ mg}}{1 \text{ ml}} = \frac{15 \text{ mg}}{\text{X ml}}$$

$$15 = 25 \bullet X$$

$$X = 15 \div 25$$

$$X = 0.6 \text{ ml}$$

Estimated Time Required: one 40-minute period

Extended Activities: Discuss different forms of measurements (e.g., liquids, solids) and different measurement systems (e.g., metric, apothecaries', household).

Authors: Kenneth Kroah, Applied Mathematics; Jeanie Blake, Licensed Practical Nursing; Connie Hilty, Applied Communications; Muskingum-Perry Career Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Area: Applied Math and Science (see correlated plans, which follow); Applied Communications

Activity Topic / Skill Area: Medical Facility Construction: Entrepreneurship in Medicine

Description of Workplace Context: Knowledge concerning entrepreneurship and employability issues creates valuable employees. The knowledge needed to operate a medical facility safely and economically, staff it appropriately, abide by licensing regulations, and honor the patient bill of rights and ethics is a must for every successful health care worker.

Description of Related Classroom Activity: In the vocational classroom, students are introduced to employability issues—what they need to do to get employed and stay employed. Many of these issues can be presented in the form of role-playing.

Guest speakers, field trips, and job shadowing aid the student in discovering the following documents/issues: policy and procedure manuals, job descriptions, safety rules, evacuation procedures, evaluation procedures, MSDSs, licensing requirements, patient bill of rights, employee handbook, and professional code of ethics.

Tools for finding needed information in standard workplace documents (e.g., table of contents, index, lead paragraphs, summaries, headings) could be studied in applied communications.

Students then design a sample medical facility following the provided guidelines, with an emphasis on safety. The use of technology in the creation of these design documents is required for all students.

Materials / Equipment: Handouts, worksheet, job shadow packet, sample manuals, MSDSs, patient bill of rights, role-play scenarios, sample code of ethics, guidelines for medical facility construction

Estimated Time Required: This project runs throughout the entire year, from the first day until the last day of school.

Extended Activity: Students could present their completed projects to business and industry at a prearranged meeting in school or in their places of business.

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Area: Mathematics

Activity Topic / Skill Area: Medical Facility Construction: Measurement, Similarity, Scale, Cost Analysis

Description of Workplace Context: This project is meant to be fun for future health care professionals as they investigate and learn about cost, medical equipment, tools, and supplies. Investigating the best design of a medical facility gives them key insights into the positioning of medical "stations" throughout the workplace. They also gain a great appreciation for the cost and care involved in creating and maintaining a facility.

Description of Related Classroom Activity:

Students study similar shapes and ratio and proportion as a prerequisite geometry unit. This gives them the foundation for converting a large facility into a small scale.

Students investigate medical equipment and supplies, prices, safety concerns, best designs of facilities, etc., during lab and applied communications class.

In math class, students make a decision concerning the type of medical facility they will choose to design and then sketch a rough draft with no regard for scale. This rough draft is evaluated and discussed by the lab teacher. In the meantime, students in math class learn how to use an architect scale to draw lines in the following scales: 1/4" = 1' and 1/8" = 1'.

Once this is mastered, the math teacher supplies the students with the appropriate graph paper (1/4" or 1/8" full size—easily obtained from drafting or landscape design programs or purchased) and a floor plan in a different scale. Students redraw the floor plan onto the graph paper in the appropriate scale (dependent on the size of the floor plan). They see the application of similar shapes and scaling as they reproduce this initial floor plan.

Finally, when students have mastered using graph paper for scaling a floor plan and have finalized the rough sketch of their medical facility design, they reproduce their rough design on graph paper in scale.

Materials / Equipment: Graph paper, architect scales and worksheets, any residential or commercial floor plan (obtain from magazine, book, or drafting class), a computer software floor plan generator or CAD-type program for extended activity

Estimated Time Required: 9 hours of class time, as follows:

- Similar shapes prerequisite: 180 minutes if necessary
- Discussion of design, decision making, and initial rough sketch: 90 minutes
- Architects scale: 90 minutes
- Converting floor plan to graph paper: 90 minutes
- Final floor plan on graph paper: 90 minutes

Extended Activities:

- Purchase a computer software floor plan generator or a simple CAD program (such as Key CAD), and have the students create their floor plans on the computer. This could only be done if there were sufficient time to train students and complete the work.
- Arrange for the health occupations students to meet with engineering/drafting students to discuss their designs and have them put their designs on AutoCAD and plot them full-size.
- Arrange for the health occupations students to meet with landscape design students to discuss their designs and learn how to ink a floor plan by hand.

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Occupational Areas: Allied Health Tech Prep / Health Occupations

Academic Area: Science

Activity Topic / Skill Area: Medical Facility Construction: Safety Regulations

Description of Workplace Context: Creating a health care facility involves more than building a physical structure. The economy, values of society, law of supply and demand, and technological developments must be considered. A modern health care facility must be able to provide for the physical, emotional, and social needs of clients. Safety practices and procedures protect health care workers as well as their clients. Many of these safety practices and procedures are not only good medical practices, but also the law. It is the responsibility of the health care facility and its employees to abide by these regulations. Violations can result in legal consequences, such as malpractice suits, termination of employment, loss of license to practice, and even the closing of the facility.

Description of Related Classroom Activity: In this activity, students explore current safety regulations involved in operating a medical facility.

Students are introduced to the principles of asepsis and safe body mechanics by lecture, handouts, videos, modeling, and demonstration. They then practice and demonstrate proficiency in gloving and proper hand-washing techniques.

Guest speakers, such as an EMT, show students the procedures used in positioning and moving patients with various injuries. Students then practice those procedures on each other using mock emergency scenarios.

OBRA and OSHA regulations are reviewed, and the procedures for identifying and reporting specific hazards are investigated, with a focus on fire and electrical hazards, disposal of hazardous wastes, emergency disaster procedures, and emergency first aid. After investigating these procedures, students create a safety manual for their proposed health care facility. They also design procedure charts and posters to be used in their facility.

Materials / Equipment: Worksheets, handouts, resource and reference books, Internet access, computers, poster board, federal regulations, and sample safety procedure manual

Estimated Time Required: The lecture part of this activity will take two 90-minute classes. Each guest speaker and related practices/activities will take one 90-minute period. The research and actual creation of the safety procedure manual and posters/charts will take approximately 1 week.

Extended Activity: This activity is one part of a year-long project for students. The project ends with a completed model of a health care facility, which is presented to area business and industry representatives.

Authors: Sandra Monti, Applied Science; David Cairns, Applied Mathematics; Loxie Kistler, Allied Health Tech Prep; Warren County Career Center

Occupational Area: Medical Technologies (DHO)

Academic Area: Applied Communications

Activity Topic / Skill Area: Phone Communication

Description of Workplace Context: Medical workers have frequent interactions on the telephone with patients and physicians. Good phone etiquette is important to conveying a professional image, and medical workers must keep their wits about them, control the conversation, and listen well in order to get the data they need.

Description of Related Classroom Activity: Develop a variety of scenarios outlining the content of phone calls that a medical tech might receive on the job. Assign each scenario to a student caller (perhaps students in a drama department), and have each caller phone a med tech student (in the lab or classroom), who then has to gather essential information from the caller. It would be helpful to have a speaker phone so both sides of the conversation could be heard.

Materials / Equipment: phone equipment, standard information form

Author: R. Eric Worstell, Applied English; Whitmer CTC (Toledo, Ohio)

Health Services

Occupational Area: Medical Technologies (DHO)

Academic Area: Applied Communications

Activity Topic / Skill Area: Technical Writing, Interview Skills

Description of Workplace Context: Admitting clerks are required to gather data from every patient, including name, date of birth, place of employment, and type of insurance coverage. This information is carried with the patient throughout his/her stay and used in billing. Accuracy is very important.

Description of Related Classroom Activity: Pair up students. Designate one as an incoming patient and the other as an admitting representative. Have students role-play a standard admission process, with the patient-student providing all required information, and the clerk-student recording the data. Evaluate the clerk based both on the accuracy of the data gathered and quality of his/her interaction with the patient. The situations could be videotaped and replayed and discussed as a closure activity.

Materials / Equipment: copies of an actual patient admission form (e.g., system downtime form from a local hospital), video camera (optional)

Author: R. Eric Worstell, Applied English; Whitmer CTC (Toledo, Ohio)

Occupational Area: Medical Technologies (DHO)

Academic Area: Applied Communications

Activity Topic / Skill Area: Technical Writing

Description of Workplace Context: RNs, LPNs, and EMTs are all required to accurately document the condition of their patients, even under duress in the emergency room.

Description of Related Classroom Activity: Set up a simulated emergency situation in the classroom, with the instructor calling off statistics and students charting them on an emergency/trauma patient documentation sheet. Make this a timed activity to simulate the intensity of the emergency room. Evaluate students on how accurately and clearly they charted the information.

Materials / Equipment: actual emergency/trauma patient documentation sheet (e.g., from a local hospital)

Author: R. Eric Worstell, Applied English; Whitmer CTC (Toledo, Ohio)

Occupational Area: Health Services

Academic Area: Applied Mathematics

Other Suggested Integrated/Applied Lesson Topics:

- Obtaining accurate measurements using measuring devices common to health field (e.g., pulse oximeter, EKG, blood pressure cuff, spirometer, sphygmomanometer)
- Measuring total vital lung capacity
- Using spreadsheets for office record keeping

Occupational Area: Health Services

Academic Area: Applied Science

Other Suggested Integrated/Applied Lesson Topics:

- Determining pH of liquids (e.g., urine)
- Analyzing density of liquid medications
- Measuring electricity relative to defibrillators (HCT)
- Testing different types of cleaning agents to determine their effectiveness in killing germs (growing cultures in petri dishes)

Occupational Area: Health Services

Academic Area: Applied Communications

Other Suggested Integrated/Applied Lesson Topics:

- Dealing with unhappy/difficult patients
- Conducting telephone triage (e.g., evaluating patient's physical and emotional state prior to determining how to proceed)
- Developing and delivering presentations to students in other programs concerning specific health risks

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Communications / Applied Mathematics

Activity Topic / Skill Area: Writing (organizing facts, details, and examples in logical order)

Description of Workplace Context: In the workplace, the paper trail is sometimes as important as the product. Time on task equates to quality control, quality assurance, and ultimately profit. The worker must provide as much information as possible on the job order to correctly charge the job. The weekly log is designed as a preliminary step to the work order job description.

Description of Related Classroom Activity: Using the Student Weekly Log (attached), complete the following steps:

Step One

- Fill out general information.
- Write legibly.
- Use correct spelling.
- Demonstrate completeness in all written materials.
- Organize facts and details in logical order.

Step Two

- On a daily basis, record jobs performed, skills learned, and questions you have in the appropriate areas on the form.
- Record starting and stopping times for each day (rounded to the nearest half hour).
- Omit Saturday and Sunday.
- Total hours for the week.
- Multiply hours x hourly rate (as assigned by teacher) to obtain Gross Wage.
- Sign your log sheet and date it.
- Submit log sheet to vocational teacher for additional comments and signature.
- Vocational teacher will submit to applied communications teacher for final evaluation.

Materials / Equipment: Handout

Authors: Ken Kirby, Welding; Cathy Deardoff, Applied English; Manchester Technical Center (Middletown, Ohio)

STUDENT WEEKLY LOG

Student _____ Employer _____

Report for Week of _____ to _____ Supervisor _____ Phone _____

JOBS I PERFORMED THIS WEEK	NEW SKILLS OR INFORMATION I LEARNED THIS WEEK

CONCERNS / QUESTIONS / PROBLEMS I HAVE

	Time Started Working	Time Stopped Working	Number of Hours Worked
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Sunday			

Total Hours _____ x Hourly Rate _____ = Gross Wage _____ Days Absent _____ Days Late _____

Instructor / Employer Comments

Student Signature _____ Date _____

Instructor/Employer Signature _____ Date _____

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Mathematics, Applied Communications

Activity Topic / Skill Area: Writing and Reading Directions

Description of Workplace Context: Workers in all occupations must at times follow a specific set of directions to successfully complete an assigned task. Likewise, they must sometimes explain to others how to complete a particular task, and their explanations must be clear, complete, and accurate.

Description of Related Classroom Activity:

- Vocational Class: Following instruction on how to perform a specific vocational skill, students practice this skill.
- Communications Class: Instructor explains the process for writing directions and gives examples of informational process papers. Each student then develops an illustrated set of instructions for performing the vocational skill learned.
- Math Class: Instructor helps students develop a materials list and cost breakdown to accompany the directions.
- Evaluation: Students exchange their drafts and critique each other's work. They then revise as necessary before handing them in for evaluation. Each paper is evaluated by the communications teacher (effective organization, adequate development, etc.); by the vocational teacher (technical accuracy and safety); and by the math teacher (materials list and cost breakdown).

  The paper judged to be "best" is given to a novice who is asked to perform the task with only the student's illustrated directions to guide him or her. The experiences of this person in trying to follow the directions are used as the basis for a class critique.

Lesson Results: Students debated sharply among themselves concerning the correct approach to use in performing the skill. This helped them clarify in their own minds what was to be done and how best to approach the assignment. As for the novice's performance, the school's director successfully completed the task using the student's directions.

Authors: Charles Pomroy, Applied Communications; Linda Burrell, Applied Math; Ken Gebhart, Electrical Trades; Washington County Career Center (Marietta, Ohio)

Sample Health Services Applications:

- Perform a venipuncture
- Bandage a wound
- Make a bed
- Collect a sample
- Turn a patient

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Communications, Social Studies

Activity Topic / Skill Area: Research / Referencing

Description of Workplace Context: Business and industry are now part of a global paradox whereby the smaller company is a major team player in the final product. An awareness of the global ties of local manufacturers becomes visible with global identification and mapping.

Description of Related Classroom Activity: During a student internship or other on-the-job experience, students are to compile a list of the business's major customers, clients, suppliers, etc., and their geographical locations. (Students might discover that a small-town business subcontracts for a St. Louis firm that is working on a job for Beijing, China.)

Armed with this information, students will return to the English classroom and, using reference tools, locate the towns and/or states and/or countries on a wall map. Students will also create a legend for the map, color-coding pins/flags to the business and its customers, clients, subcontractors, etc.

Materials / Equipment: Reference materials (encyclopedias, computers with related software, wall map, identification pins)

Estimated Time Required: Class Period

Authors: Ken Kirby, Welding; Cathy Deardoff, Applied English; Manchester Technical Center (Middletown, Ohio)

Occupational Area: Any and All Vocational Programs

Academic Area: Applied Communications

Activity Topic / Skill Area: Team Building (interviewing, listening skills, speaking skills)

Description of Workplace Context: Team building is a major component of business and industry. Working together develops pride in the product or service and ownership of its success. Teaming is an activity that builds on a multitude of experiences and the exchanging of roles within the team.

Description of Related Classroom Activity: For the purpose of the student internship, teams of 3 or 4 students will be created. Within each team, roles will change at each site. The team roles will be—

- interviewer: asks questions of the site host
- recorder: records answers, takes notes, etc.
- safety inspector: identifies and records examples of good safety practices, locations and visibility of fire extinguishers, first aid stations, etc.

Materials / Equipment: Pen/pencil, paper, prepared "data discovery" sheet

Estimated Time Required: Length of internship visit

Authors: Ken Kirby, Welding; Cathy Deardoff, Applied English; Manchester Technical Center (Middletown, Ohio)

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Area: Applied Communications

Activity Topic / Skill Area: Time Management

Description of Workplace Context: There's more to work than producing a model product. The product must also be produced in a timely fashion. The secretary who takes 3 days to produce that perfect letter will not last long in the workplace. The proposal that is completed a day after the final deadline is not a winning proposal.

Description of Related Classroom Activity: Students are provided with information on time management and with One-Minute Manager Goal Sheets adapted from Kenneth Blanchard's book, *The One Minute Manager* (Berkley, 1993). Each student must then complete one of those sheets for each 3-hour vocational lab (or workday at a co-op placement). This involves the following steps:

- At the beginning of each session, the student writes down his or her goals for the session. The goals must be stated in behavioral terms and in positive language (e.g., ***not*** "I will not waste time."). The student must then indicate an estimated time to reach each goal. Where goals are large, they should be broken down into steps.
- The student records the time work was begun and completed on each goal. If it takes longer than estimated to complete a goal, the student must prepare a written summary statement describing the circumstances that caused the delay.
- The goal sheets are handed in to the applied communications teacher daily. Three points are awarded for a sheet that meets all requirements, and the total points earned for these sheets make up 30 percent of the quarterly grade. Points are deducted for missing information, misspelled words, and grammatical errors in written summary statements.

Lesson Results: Students come to see the value of time management and how it affects job performance. Having students do the sheets also provides for closer interaction between the applied communications and vocational teachers. Furthermore, the applied communications teacher learns a great deal about the occupational context—what tasks students actually perform in the lab and on the job—by reviewing these daily forms.

Authors: Darrell Banks, Travel & Tourism; Robert M. Stumpf II, Applied Communications; Ryan Wright, Applied Mathematics; Knox County Career Center (Mount Vernon, Ohio)

Occupational Area: Any and All Vocational Programs

Academic Area: Any and All Academic Areas

Activity Topic / Skill Area: Math Day

Description of Workplace Context: Measurement is part of most every occupation. Accurate measurements are essential.

Description of Related Classroom Activity: Many students have trouble with measuring. They do not have enough hands-on experiences to really understand the customary systems of measure and the conversions they are asked to make in science and math classes. Students in social studies work with maps and must be able to read scales and legends in order to determine miles and square miles. Students in vocational classes must be able to perform the measurement operations essential to the occupation.

Teachers in five classes taught short daily lessons that would prepare students to take part in Math Day. The lessons included measurement of length, liquids, area, perimeter, surface area, and angles.

On Math Day, students were divided into groups of four, with the ability levels of the groups equalized insofar as possible. Each room contained a series of exercises that the groups had to complete. In some rooms, for example, there was a series of stations, each with a different exercise, and students spent 10 minutes at each station. They could earn 20 points per classroom, for a total of 100 points.

- Classroom 1—Precise Measurement: Students measured various items to the inch, 1/2 inch, 1/4 inch, 1/8 inch, and 1/16 inch. Measurements needed to be exact.
- Classroom 2—Measurement of Area, Perimeter, and Surface Area: Students had to find the perimeter of the classroom, the area of the chalkboard, the surface area of the four walls, and the surface areas of rectangular solids.

- Classroom 3—Outside Measurement and Estimation: Students had to estimate a linear measurement, and then use a measuring tape to check their estimate.
- Classroom 4—Liquid Measurement: Students were given 1.5 gallons of water and had to prove the number of cups, pints, and quarts in this amount of liquid by taking a cup and seeing how many times they could fill it from the 1.5 gallons.
- Classroom 5—Map Scales and Angle Measurement: Students were given maps and asked to determine the miles between countries and cities using the "miles per inch" scale in the legend. They also had to measure and construct angles of various degrees.

Materials / Equipment: Rulers, tape measures, yardsticks, protractors, laser ruler, and measuring cups

Estimated Time Required: Entire school day

Authors: Bill Fletcher, Tech Prep Algebra; Susie Fraser, Tech Prep English; Terry Hollinger, Tech Prep Computer and Technology; Groveport Madison Freshman School (Groveport, Ohio)

Occupational Area: Any and All Vocational Programs

Academic Area: Applied Mathematics

Activity Topic / Skill Area: Application of Math to World of Work

Description of Related Classroom Activity:

- Step I: Pick a Topic. Each group of students will pick a procedure from mathematics class that can be related to their vocational field. The selected topic must be approved by the teacher.
- Step II: Preparation. Each group will be given 2 weeks to prepare a group presentation on the selected topic. Students can use textbooks and other resources to work out formulas and find trade applications. Both the mathematics and vocational teachers will serve as resources for student efforts.
- Step III: Presentation. The presentation will consist of four parts: (1) to teach the math procedure, (2) to explain how it relates to the vocational area, (3) to provide a related mathematical problem from the vocational area and show how to solve it, and (4) to give examples of how this procedure is used in other vocational areas.

Lesson Results: When the teaching team tried out this plan, the results were not as positive as they had hoped. They have three recommendations for improving the activity in the future: (1) students need more teacher assistance in developing their presentations; (2) the presentation needs to start with a vocational problem and apply mathematics in its solution rather than starting with the mathematics concept; and (3) students need to be asked to use visual aids in their presentations to aid in understanding.

Authors: Rick Hupe, Plumbing; Mike Meyer, Applied Mathematics; Four County JVS (Archbold, Ohio)

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Mathematics, Applied Science

Activity Topic / Skill Area: Accurate Measurements

Description of Workplace Context: Measurements in science are never perfect. All workers are expected to make accurate measurements, but you can only measure and interpret those measurements as accurately as your tools allow. Accuracy means the nearness of the measurement to the actual or accepted value.

Description of Related Classroom Activity: Students will carry out the following steps:

- Using only a pin, string, and 12" piece of wood, make a ruler that will measure items in **inches** only.
- Measure the items listed on the data table provided by the teacher. (The data table is a five-column table. Column 1 = the item. Column 2 is for recording inches. Column 3 is for recording half inches. Column 4 is for recording quarter inches. Column 5 is for recording eighth inches.)
- Record your measurements in the first column on the data table. For each item, record the measurement you are sure of (e.g., based on a measuring device that notes only inches); then add one more digit based on your best estimate (e.g., 1.5").
- Now take your ruler, and mark it off in **half** inches.
- Remeasure each item, and record your measurements (the digits you are sure of, plus one more digit you guess is correct) in the second column on the data table.

- Now mark your ruler off in **quarter** inches.
- Remeasure each item, and record your measurements as before.
- Finally, mark your ruler off in **eighth** inches.
- Remeasure each item one more time, and record your measurements as before.

Conclusions:

- Calculate the percent error for each of your ruler units by comparing your data with the true measurements provided by your teacher.

$$\% \text{ error} = \frac{\text{measured value} - \text{true value}}{\text{true value}} \times 100$$

- How close were your values to the true values?
- When your ruler was marked off in inches, did it measure small lengths very accurately?

Extension: Look up the history of measurement, and try to determine how many different standards of measurement have been used around the world.

Materials / Equipment: 12" piece of wood, piece of string (approximately 12"), pin, list of objects to be measured, paper, pencil

Authors: Ed Hughes, Construction Trades; Lynn Eckert, Chemistry; Bob Mavers and Mary Ann Wonson, Algebra/Geometry; Lakewood High School (Lakewood, Ohio)

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Communications, Applied Mathematics

Activity Topic / Skill Area: Developing Graphs; Locating Information; Reading for Information

Description of Workplace Context: Newly hired workers need to gather information from worksites on attendance, pay scales, and processes.

Description of Related Classroom Activity: Through a teaming procedure, students will gather worksite information as outlined by participating teachers. They will then develop graphs in applied communications to compare and contrast information gathered from various worksites. These graphs will include information on employee attendance and the individual student's attendance, which will also be compared to various worksite attendance policies. Processes used at various sites will also be graphed to compare and contrast such factors as pay scales, number of employees, gender, etc. This will allow students to measure their present performance to real-world business standards/expectations and give the students a better picture of the business they plan to enter.

Materials / Equipment: Pen/pencil, data gathered, paper, graphics software program and computer (optional)

Authors: Ken Kirby, Welding; Cathy Deardoff, Applied English; Manchester Technical Center (Middletown, Ohio)

Occupational Area: Any and All Vocational Programs

Academic Areas: English, Mathematics

Activity Topic / Skill Area: Reading Story Problems

Description of Workplace Context: Sometimes an individual on the job has the knowledge and ability to solve a problem but lacks the critical reading and/or vocabulary skills to navigate the problem statement. This is particularly true in mathematics.

Description of Related Classroom Activity:

- As a teaching team, develop a list of vocabulary terms you want to cover. We chose to concentrate on math terms because we're hoping to boost math proficiency scores, and we believe vocabulary and reading skills are an issue in successfully taking the test.
- Decide on a weekly basis which terms you will concentrate on (5-10 maximum).
- Decide how the terms will be covered in the different classes without duplicating efforts. Class exercises can include analogies, open-ended questioning, true/false questions, creative matching, rhymes, fill-in-the-blank, lists, charts, contextual examples, crosswords, analysis of relationships, structural diagrams and models, and sequence diagrams. Exercises should vary from week to week and should be those most effective for the particular student group.
- In conjunction with developing a common vocabulary, teach analytical reading skills. Students often overlook important details or concentrate on irrelevant details. They make faulty inferences and illogical predictions. They may miss the main idea. We are currently integrating math story problems into the English curriculum, using 10 minutes out of the period to study the problems in terms of detail, inference, prediction, etc. If possible, the story problems can be drawn from the context of the students' occupational program(s).

Estimated Time Required: May be for a particular unit or for the entire year

Lesson Results: We have only begun to implement this, so our results are sketchy. Nevertheless, positive student response suggests that the idea for a common vocabulary is a practical one. We assume student knowledge and understanding that is not always there—or there only on a very limited level. We have learned, however, that it is important to start with a short list of terms—covering more is too difficult to handle effectively.

Reinforcing the critical reading skills has been advantageous as well. It really has been surprising the number of faulty inferences students make. Also, they often tend to concentrate on unimportant details instead of what is critical to solving the problem. In English class, we simply discuss the intent of the problem, not the answer. Again, it is important to start small.

Authors: Bill Fletcher, Tech Prep Algebra; Susie Fraser, Tech Prep English; Terry Hollinger, Tech Prep Computer and Technology; Groveport Madison Freshman School (Groveport, Ohio)

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Communications, Employability

Activity Topic / Skill Area: Job Fair

Description of Workplace Context: In nearly every business operating today, it is essential to know how to conduct a business phone call, write business letters, identify the right person to talk to within a large business structure, make clear requests for service or involvement of others in business, schedule time and space for business use, and present oneself for a business interview in a manner designed to best accomplish the interview goals. These are the very skills involved in setting up and operating a Job Fair.

Description of Related Classroom Activity: Students participating in job shadowing and 4-week internships have typically lacked the preparation and skills to get maximum benefit from the experience. To improve this situation, it was decided that students should be involved in organizing and managing a Job Fair, which would help them develop the skills needed to profit from their on-the-job experiences. The Job Fair itself would provide students with greater knowledge of specific jobs and the criteria for job placement.

- Students and teachers identify the businesses and industries to be contacted to participate in the Job Fair.
- Students work on their communication skills. How do you identify the person you need to talk to at each firm—the decision maker? What points do you need to make during the contact? (It's amazing how many students—in their zeal to convey the content—forget to mention their own name.) What strategies can you use that will help you convince the firm to participate? Once the skills have been covered, students practice them in role-play situations, which are videotaped and reviewed and critiqued.

  Students also develop a letter to send as a follow-up to the cold call. Standard business format is used, and the letter is carefully reviewed for spelling, punctuation, accuracy, and completeness.

  "Journaling" is used as well. Students keep written journals documenting their activities during the Job Fair process, from start to finish. When the Job Fair is over, students use their journal entries to prepare final written analyses.

- Using phone, fax, and computer, students contact employers—before, during, and after school—to solicit and secure their involvement in the Job Fair. As a rule of thumb, one teacher—with strong student help—can expect to succeed in securing the involvement of ***four*** businesses a month. And given the reality of other instructional requirements, the recruitment effort can usually only be sustained for two months.
- Students work on their interview skills. Again, role-playing and videotaping are used to provide students with needed feedback about their performance.
- During the Job Fair, each employer is located in an interview station, and each student is able to participate in a job interview with a real employer. Interviews last approximately 20 minutes, and brief breaks between interviews are provided. To calculate the number of interviews possible, figure 2.5 x stations x hours. Thus, if you have a 4-hour Job Fair (a reasonable time length) and 8 stations, you could expect 80 student interviews (2.5 x 8 x 4). An individual teacher who pulls together a Job Fair that yields 60 interviews has done very well, 80 interviews is fantastic, and more than 80 gives that teacher the right to appear in public in a Superman cape.
- When the interviews are completed and the stations are torn down and the room cleaned up, time is taken for reflection and celebration. Reflection may take the form of written feedback from all students, with one-on-one discussions with students who took leadership roles. A round-table approach could be used, as could pair-and-share, in which students discuss their reactions to the Job Fair in pairs and then share their common thoughts with the total group.

Materials / Equipment: Quiet, secure space with a phone for student use; computer and fax, if possible; computer support; video camera and playback capability; copying support

Authors: Bill Fletcher, Tech Prep Algebra; Susie Fraser, Tech Prep English; Terry Hollinger, Tech Prep Computer and Technology; Groveport Madison Freshman School (Groveport, Ohio)

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Math, Science, Communications, Employability, Technical Related

Activity Topic / Skill Area: Development of Multimedia Recruitment Slide Show

Description of Workplace Context: Multimedia presentations are an important part of today's world of work.

Description of Related Classroom Activity: Students in the vocational program created a presentation/slide show to be used as a tool in recruiting eighth and ninth graders for vocational programs. The math instructor, who was familiar with the presentation software, coordinated the project. The applied communications and vocational teachers provided editing and technical support. Students videotaped faculty (both vocational and applied academics), administration, and students in various scenes and then used audio to tie the presentation together as a promotional tool. The students researched and created information slides and chose music to accompany the show. They then edited the slides, voices, and music into a short recruitment package.

- Applied Math Class: Student activities focused on organizational skills. By hyperlinking text (HTML), loops can be made to connect different portions of the slide show. The sequence of the slide show needs to be charted and diagrammed before it is created. If any looping is done, a flowchart must be utilized. These skills were taught in the applied mathematics course.
- Applied Communications Class: Students edited all slide text and .WAV files to ensure that they were grammatically correct and socially acceptable. If scripting were to be done, this would be a natural for the communications class.

Materials / Equipment: Presentation software (e.g., Microsoft PowerPoint or Corel Presentations); PC (486 or higher, 16 MB of RAM or higher, sound card with speakers); flatbed color scanner; tape recorder with patch cord for PC; camera/film

Estimated Time: This is an ongoing project to be worked on intermittently and completed by the end of the first semester.

Lesson Results: More scripting was needed; there was too much repetition when speakers were given a free hand.

Extended Activity: If every program developed its own slide show, they could be compiled onto a network or stand-alone PC in the main office or entryway to the building. Using the HTML technology, anyone could walk into the building, click on a vocational program, and view a multimedia slide show about that program, prepared by actual students from that program.

Authors: Jean Benning, Applied Communications; Tom Newman, Electronics; David Cairns, Applied Mathematics; Warren County Career Center (Lebanon, Ohio)

Any and All
Vocational Programs

Occupational Area: Any and All Vocational Programs

Academic Areas: Applied Math, Science, Communications

Activity Topic / Skill Area: Tour of a Work Site

Description of Related Classroom Activity:

- Applied Communications Class: Students research a place to visit, select a place, and write to that facility requesting permission to visit and inquiring about safety requirements at that particular site. Students could also invite someone from the facility to come to class to talk about the company/institution/agency and its products and/or services. After a brainstorming activity concerning what students want to see and learn during the visit, they prepare interview guides for the trip.
- Applied Math Class: Student activities focus on the types of jobs performed at that company involving math (e.g., payroll, inventory, schedules, charts, and records).
- Applied Science Class: Instruction covers science concepts related to the products or services students will observe during the visit.
- Occupational Class: The vocational teacher covers occupation-specific concepts and tasks related to the company's products or services.
- The Visit: Students compare what they see with what they learned in class, keeping notes of their findings. They ask questions using their interview guides.
- After the Visit: Students discuss what they did and saw and how it differed from what they expected. They write thank-you notes.

Authors: Jim Davis, Precision Machining; Sophie Garrity, Applied Science; Belmont-Harrison JVSD (St. Clairsville, Ohio)

Insert the
"Information
Superhighway"
Tab Here

The Information Superhighway

If you are already jogging down the Information Superhighway, you can skip ahead to the curricular resource list, which begins on p. 205. If not, the following is a simplified explanation of what it is and what it has to offer.

The Information Superhighway is an extraordinary access route to an enormous amount of information. These days, everyone and his or her uncle is putting up a Webpage on the Internet or World Wide Web, accessible by a URL. But what do these terms mean?

The Internet

Originally established during the Cold War as a mechanism for ensuring defense-related communication nationwide, the Internet has become a mega-network comprising—and allowing access to—other large and small networks.

When used in a nongraphical environment (think of IBM without Windows), the Internet was accessible mainly to those with significant computer skills. The rest of us could access only the tip of the iceberg. With a graphical environment (Macintosh or Windows) and the Net software available today, Internet access is quite easy and friendly.

Many forms of communication take place on the Internet. Under the Internet umbrella, users can search for information on the World Wide Web, communicate via e-mail, and participate in electronic newsgroups and listservs.

The Web

Now, what about the *World Wide Web* (or simply, the *Web*)? Think of a spider's web—concentric circles connected with multiple cross-hatching. That's what the World Wide Web is like. It links documents together and allows you to contact one site and then connect to other related sites with a mere click of a graphic button (*surfing* the Net).

In subsequent pages in this section, we will look at some specific Websites relating to vocational education and applied academics. This list is not too extensive, and there's a reason for this. The Web changes constantly. Any print list is soon out of date. But not to worry! There are numerous search engines and sites whose sole job is to get you where you want to go on the Information Superhighway. Thus, the first list of sites at the end of this explanation will be those designed to help teachers locate additional sites of interest to them.

Browsers and Search Engines

A *browser* is software (e.g., Netscape Navigator, Microsoft Internet Explorer) that, as its name suggests, allows you to browse (or navigate) on the Web. The browser may be provided by your Web service, or you can buy the software yourself.

Search engines in the browser (e.g., Google, Excite, Yahoo, Infoseek, Lycos) allow you to search an index of Internet subjects. Using one of these free devices, you simply key in the term(s) you want to search and it does the work. Most search engines provide help or search tips to aid you in locating the desired information, and most allow you to modify and narrow your search as you go along. The results display as a list of items, usually sequenced according to how likely they are to be relevant. You can then scan the list to see if you've gotten a "hit."

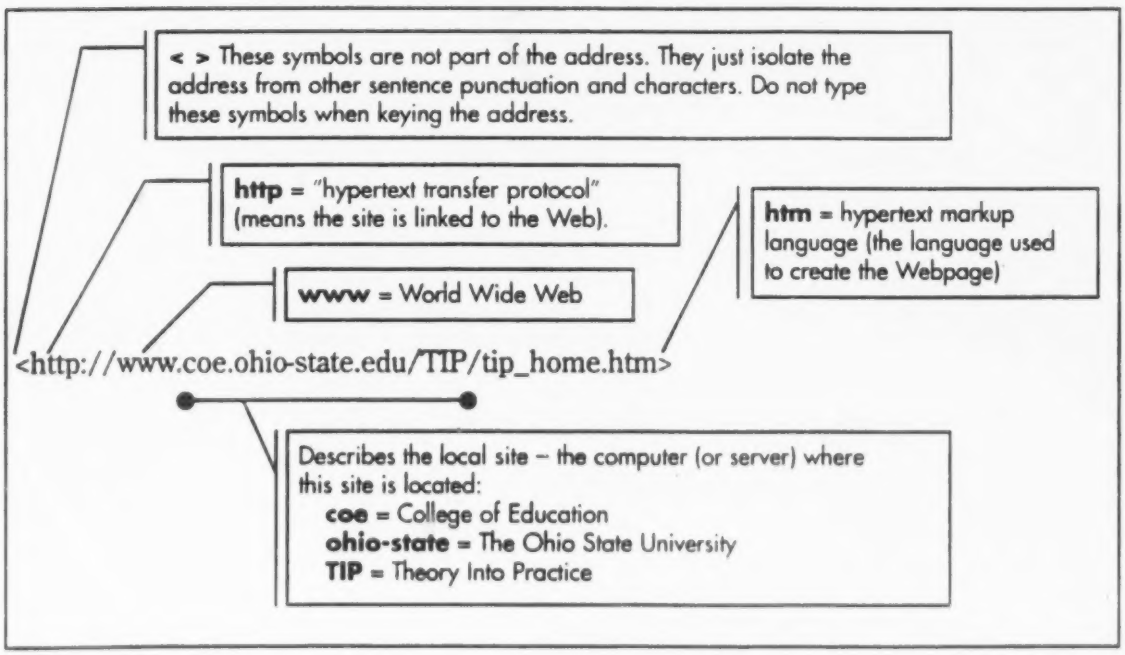
TKM's Education Web Search
<http://alpha.tkm.mb.ca/education>

Some search engines are designed specifically to locate resources for educators. However, even the general search engines usually allow you to pick a general subject such as *education* first before commencing your specific search.

URLs

It is not necessary to use a search engine if you know the site's actual address—its URL, which means "uniform resource locator." As an example, let's decipher the Website address for the educational journal *Theory Into Practice*:

<http://www.coe.ohio-state.edu/TIP/tip_home.htm>


< > These symbols are not part of the address. They just isolate the address from other sentence punctuation and characters. Do not type these symbols when keying the address.
http = "hypertext transfer protocol" (means the site is linked to the Web).
www = World Wide Web
htm = hypertext markup language (the language used to create the Webpage)
<http://www.coe.ohio-state.edu/TIP/tip_home.htm>
Describes the local site – the computer (or server) where this site is located:
coe = College of Education
ohio-state = The Ohio State University
TIP = Theory Into Practice

Webpages and Homepages

A *Webpage* is everything at your Website—a misnomer since it's often more than one page. A *Homepage* is like a home base for the *Website*. It often gives a brief description of the individual or the organization that established the site, a menu of its contents, and descriptors you can click for more information on particular topics.

These days, the problem is not so much finding what you want—it's trying to stay focused. So much is available that you may spiral from one link to another, disappearing for hours or days as you peruse the fascinating contents of the Net.

- When you pick up a magazine, you're likely to see a Web address where you can get information or send e-mail to express an opinion.
- On TV, networks and programs often list a Web address for use by viewers. There are sites for new movies, fan clubs, sports teams, news organizations, and advertisers.
- Do you want to see what publications are available from a publisher? Just use a search engine to access its Website and search the catalog.
- Want to know what's happening of relevance to teachers at the National Science Foundation?
  - ✓ National Science Foundation <http://www.nsf.gov>
- Want to contact your professional teachers association?
  - ✓ National Education Association <http://www.nea.org>.
  - ✓ American Federation of Teachers <http://www.aft.org>
  - ✓ National Council of Teachers of English <http://www.ncte.org>
  - ✓ National Council of Teachers of Mathematics <http://www.nctm.org>
  - ✓ National Science Teachers Association <http://www.nsta.org>
  - ✓ Association for Career and Technical Education (formerly American Vocational Association) <http://www.acteonline.org>

Want to create vocabulary puzzles that include information at any depth you desire? Try <http://www.puzzlemaker.com>.

Sheila Oehler
Chemistry, Anatomy, Physics
Buckeye Hill Career Center

Notice the pattern in those Web addresses? Sometimes you don't need a search engine, just a little common sense. Acronyms are often used in addresses, followed by a descriptor of the type of entity:

- Organizations = *.org*
- Government agencies = *.gov*
- Colleges and universities = *.edu*
- Commercial firms = *.com*

E-mail

E-mail is "electronic mail"—messages that arrive at your computer when sent to your electronic mailbox address. (Your service provider will usually help you devise an acceptable mailbox address.) E-mail software allows you to access and transmit e-mail messages.

E-mail can have enormous benefits. Individuals used to spend hours playing telephone tag—calling and returning calls without ever reaching each other. Now an e-mail message can be sent directly to that individual, who can then respond at his or her earliest convenience.

The ease of communication is probably its chief benefit. Consider this example. Assume you are a new English teacher and some of the mail that arrives in your school mailbox (catalogs and such) is addressed to your predecessor. If you have to write or call to request that such mail now be addressed to you, you may not get around to it. If all you have to do is send off a quick e-mail message from your computer, you are much more likely to do it.

Or consider international communication. Americans with business dealings with countries behind the Iron Curtain used to have a terrible time making contact because the phone systems were so archaic and because the time zone differences are so vast. As organizations and individuals in those countries have begun to come online, the ability to communicate has eased enormously.

Whereas an Internet, or Web, address gets you to a computer site and its contents, an e-mail address reaches a live human being. If, for example, you want to contact someone at the ERIC Clearinghouse on Adult, Career, and Vocational Education (ERIC/ACVE) to ask a question or request help in searching the ERIC database, you can simply send an e-mail message to <ericacve@osu.edu>. Many Websites provide an e-mail connection (i.e., click here to send an e-mail message to the originator of the site).

When you subscribe to a *newsgroup* (described below) that supports teacher chat, you will often find opportunities for Net pen pals. For example, a teacher, perhaps in Singapore, might give an e-mail address and ask for messages from American students. It is a small world after all.

Newsgroups

Newsgroups are established groups—or bulletin boards—related to a specific topic, to which Internet users can subscribe. Some are read-only newsgroups produced by news services (e.g., *clari* groups from Reuters). Some are for discussion—either open (no one's in charge) or moderated.

Searching for Newsgroups

If you have friendly software, you can easily search the available open groups (and they are legion) using key words such as *teacher, science, math, english* (yes, english, not English; the search is case-sensitive), *health, medical* (or *med*) and *education*. A sampling from the over 500 newsgroups recently found in such a search is shown in the margins. People in these groups share information of potential interest to each group, express opinions, or ask for help in a particular area.

Sample Newsgroups:

k12.chat.teacher
misc.education
clari.news.education
clari.news.education.misc
clari.news.education.releases

sci.math
sci.math.num-analysis
sci.math.research
sci.math.symbolic
k12.ed.math

k12.ed.science
clari.tw.science
clari.tw.science+space
misc.education.science
sci.space.science

Subscribing

Today's friendly software makes accessing the newsgroups easy. For the most part, to "subscribe" you simply select the groups you want to follow. Subsequently when you open up the program, a list will appear of the groups to which you have subscribed. The program will let you scroll through the groups to see what messages have arrived. As each group is accessed, a list will appear of all messages received. Each is identified by its subject line, which allows you to get an idea of whether you want to read it or not.

Be advised: New users always want to subscribe to all groups even remotely of interest and to read all messages received. You cannot maintain this pace and keep your sanity (or your friends and family). Be selective in the groups you pick and the messages you choose to actually read. Particularly when a group is not moderated, there can be a tremendous amount of junk (or even offensive material) posted to the group.

Netiquette and FAQs

There are protocols (called *Netiquette*) for using these discussion groups, and if you violate these protocols, you can expect to be *flamed*—messages intended to slap your hand or, worse, insult your intelligence, will be posted publicly online. Your service provider should automatically subscribe you to a group for new users, which will regularly repost articles about protocols, procedures, and answers to *FAQs* (frequently asked questions). If you wish to be a knowledgeable participant—and to avoid being flamed—it is critical that you read them!

k12.lang.art
alt.usage.english
misc.education.language.
english
alt.support
alt.support.asthma
alt.support.cancer
alt.support.eating-disord
clari.biz.industry.health
clari.biz.industry.health.care
clari.biz.industry.health.care.
releases
clari.biz.industry.health.
pharma
clari.biz.industry.health.
pharma.releases
clari.news.issues.reproduction
clari.news.issues.smoking
clari.tw.health
clari.tw.health.misc
misc.kids.pregnancy
sci.med
sci.med.aids
sci.med.dentistry
sci.med.diseases.cancer
sci.med.nursing
sci.med.nutrition
sci.med.pharmacy
sci.med.radiology
sci.med.vision
sci.optics
sci.psychology.misc
sci.research
soc.support.pregnancy.loss

A list of selected listservs for nurses—together with information on how and where to subscribe—is provided at the following Website:

<http://www.springnet.com/pn/pnlstsrv.htm>

Mailing Lists

Like the newsgroups, mailing lists allow Internet users who share an interest to participate in a discussion group. What are the differences? Fewer mailing lists are available; they are not listed neatly in one place for you to pick from; and you can only "chat" on one if you ask to subscribe and are accepted.

How Mailing Lists Work

A software program (a *listserver*) receives all messages sent to the list and redistributes them to all the subscribers. Each mailing list has two addresses: one where you send a message asking to subscribe; the other where (once accepted) you send messages to be redistributed. (You can always tell a rookie when you open the mailing list messages and find one focused not on the subject but, instead, asking to subscribe.)

CAREERTECH

One mailing list relevant to teachers of vocational education and applied academics is CAREERTECH, maintained by the National Dissemination Center for Career and Technical Education at The Ohio State University. To ***subscribe***, address an e-mail message to <listserver@lists.acs.ohio-state.edu>. Leave the subject line blank, and turn off your signature line. The message should read (no more, no less):

subscribe careertech *yourfirstname yourlastname*

Once you are notified that your subscription has been activated, you will then receive—via e-mail—all messages sent to the group and can reply or initiate your own messages. The address for e-mailing ***messages*** to the mailing list is <careertech@lists.acs.ohio-state.edu>

Internet Access

To access the Internet, you will need equipment, software, and an account.

- ***Equipment.*** Basic equipment includes a computer and a device allowing your computer to connect to the Internet (e.g., telephone-line modem, cable modem, or Ethernet card).

One caution about computers: As more and more Websites are built that are graphically sophisticated or that contain access to huge catalogs, you will need a computer with enough speed and memory to deal with it. Older machines with minimal memory are prone to freeze up, shut down, or send error messages when you try to access a site with more content than your computer can handle. You can *download* (move the content from the Website to your own computer) a great deal of material—even movies and videos—if you have the equipment capability and the time.

- ***Software.*** You will also need communication software for the various functions (e.g., e-mail, WWW, newsgroups). Some software can be downloaded free of charge once you have gained access.
- ***Account.*** Next you need an Internet account in order to establish contact.
  - ✓ If you are taking courses at a university, you may have an Internet account through the university. Or your school may provide Internet access.
  - ✓ If not, you will probably have to subscribe to a commercial online service, either national (e.g., America Online, CompuServe, Prodigy) or local. Internet service providers (ISPs) will charge you either a flat monthly rate or a base rate plus additional for extra usage.
  - ✓ Freenet may also be available (check your local library for information), but its low-end technology provides text only, so it is not recommended for someone who wants a friendly graphical environment.

Mega-Websites . . . to Take You Almost Everywhere You Want to Go

One of the easiest ways to access educational materials on the Web is to use one of the Mega-Websites especially designed to link people to key educational sites. Several such sites are described below.

AskERIC
<http://ericir.syr.edu>

→ AskERIC

ERIC (Educational Resources Information Center) is the national educational information system sponsored by the U.S. Department of Education. AskERIC is an awesome link to those resources. The Homepage lists six topics from which to choose: About AskERIC, Question & Answer Service, Virtual Library, New and Noteworthy, Research & Development, and ERIC Database Searches.

If you select the AskERIC Virtual Library, you will get ten more choices:

- ***AskERIC Toolbox***—Provides links (*gateways*) to educational sites, Internet project resources, cool sites for kids, and Internet search tools and training resources. Want to see the Homepage for the CIA, Library of Congress, National Science Foundation, NASA Spacelink, Smithsonian, or PBS? Simply click on the entry. Many of the sites you will want to use are listed here—one-stop shopping. If you want a site that's not listed, search engines for looking further are also provided. If you're having trouble using the Internet, you'll find Internet training sites here to help you.
- ***AskERIC Infoguides***—Provides access to an extensive list of Infoguides on such subjects as chemistry resources, earthquakes, earth science, the environment, weather, grammar instruction, teaching Shakespeare, education software, freeware, Internet resources, and portfolio assessment.
- ***AskERIC Lesson Plans***—Links users to lesson plans submitted to the ERIC database and highlights new plans each month. Also provides links to other online sources of lesson plans.

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- ***Special Projects***—AskERIC works with several organizations, supporting their efforts in providing education information over the Internet. Current special projects include the Gateway to Educational Materials (GEM), Virtual Reference Desk, Consortium for School Networking (CoSN), Cross A K-16 American History Curriculum, Newton's Apple Educational Materials, Chinese Historical and Cultural Project (lesson plans), and NASA SIR-C Education Program (SIR-CED).
- ***Education Mailing List Archive***—Pick a mailing list of interest to you from this listing, and you will find a list of articles posted to the group, arranged by year, then month.
- ***ERIC Resources***—Allows you to search the ERIC database and the materials developed by ERIC staff (digests, bibliographies, etc.).
- ***ERIC Conference Calendar***—Lists education-related conferences available each month. Information provided includes conference site, sponsor, date, location, topics, and intended audience.
- ***Television Series Companion Materials***—Provides access to educational resources (including lesson plans) produced by various networks (PBS, CNN, C-SPAN, ABC, CBS, Discovery Channel), some of which are designed to be used in conjunction with their programming.
- ***More Educational Resources***—Links to organizational resources such as the U.S. Department of Education, National Library of Education, Regional Educational Laboratories, Vocational Education Resources, National Service Learning Clearinghouse, and Instructional Technology Resources.
- ***Professional and Commercial Announcements***—Provided as a service to AskERIC users, these announcements carry no intention of endorsement.

One ERIC resource useful to users of the Internet is a recent document produced by ERIC/ACVE on information management, which includes sections on how to choose and use search tools, helpful information management tools, and various search engines and their features. A full-text version of this document is online at <http://ericacve.org>. Once at the site, click on Publications, then Practitioner File, then Information Management.

Kathy Schrock's Guide for Educators
<http://discoveryschool.com/schrockguide>

→ Kathy Schrock's Guide for Educators

This site is massive—but so well organized and so user-friendly that the size seems manageable. It is updated daily and has won so many awards that it takes two pages just to list them. Sections of interest include links to health and medicine, Internet information, literature and language arts, mathematics, news sources and magazines, reference sources, science and technology, vocational education, and Website evaluation tools.

The Cornell Theory Center
<http://www.tc.cornell.edu/Edu>

→ The Cornell Theory Center

This site provides links to resources for K-12 educators and students through three gateways. The Arts & Social Sciences Gateway includes resources in language arts, foreign languages, fine arts, economics, social studies, and history. The Math & Science Gateway provides links to resources in subject areas such as astronomy, biology, chemistry, computing, the environment, health, mathematics, and physics. A page of links to science and art museums is also available. The Gateway for Educators contains links to information on curriculum, lesson plans, software for the classroom, Internet guides and reference materials, and how to set up Web servers in the schools. Links to other K-12 collections on the Internet are also provided.

TeacherLINK
<http://www.teacherlink.usu.edu>

→ TeacherLINK

TeacherLINK is a searchable online teacher resource center provided as a service to public education by Utah State University's College of Education, the Educational Resources and Technology Center, and the NASA Educator Resource Center. It includes teacher resources (links, lesson plans, pictures, software, etc.) and links to extensive NASA resources and opportunities for public educators.

→ Vocational Education Resources

Provides extensive gateways to sources for general information about vocational education, curriculum resources for vocational education, school-to-work/tech prep, research in vocational education, federal government information on vocational education, legislation on vocational education, publications for vocational education, higher education and public school resources within vocational education, international interests in vocational education, career and job information in vocational education, and training in vocational education.

Vocational Education Resources
<http://pegasus.cc.ucf.edu/~sorg/vocation.html>

→ NOICC Homepage

The Homepage of the National Occupational Information Coordinating Committee provides access to a wide range of workforce and career development information and resources, including job search sites, career information, career development guidance and counseling, labor market information and education sites, SOICC (state-level) sites, a calendar of events, and NOICC/SOICC initiatives, resources, and activities.

NOICC Homepage
<http://www.state.ia.us/government/wd/noicc>

Other Mega- and Mini-Sites

Academic Innovations: Hot Sites and Ideas
<http://www.academicinnovations.com>

BellSouth Education Gateway
<http://k12.bellsouth.net>

Busy Teachers' WebSite K-12
<http://www.ceismc.gatech.edu/busyt>

The Chalkboard: A Classroom Corporate Connection
<http://www.thechalkboard.com>

Classroom Connect
<http://www.classroom.net>

CoolSchool
<http://coolschool.edu>

Education Central
<http://www.geocities.com/Athens/Oracle/1201/main.html>

Education World
<http://www.education-world.com>

Individual sites may contain--

Chat rooms

Clip art

Electronic texts

Glossaries

Histories & Biographies

Lesson plans

Links to other sites

Links to search engines

Reference tools

Searchable databases

Virtual factories

Virtual field trips & tours

Worksheets & forms

Federal School-to-Work Homepage
<http://www.stw.ed.gov>

Federal Resources for Educational Excellence
<http://www.ed.gov/free>

Gateway to Educational Materials (GEM)
<http://www.thegateway.org>

Internet Connections: Lesson Plans and Activities
<http://www.mcrel.org/resources/links/lesson.asp>

Lesson Plan Links
<http://edcen.ehhs.cmich.edu/~tvantine/edlesson.html>

LiveText
<http:// www.ilt.columbia.edu/k12/livetext>

Miami-Dade Curriculum Connections
<http://www.dade.k12.fl.us/curriculum>

PedagoNet
<http://www.PedagoNet.com>

Real Kids Teacher's Lounge
<http://www.realkids.com/lounge.htm>

Teachers.Net
<http://www.teachers.net>

Teachers Network
<http://www.teachnet.org>

Teachers' Pet Pages
<http://www.geocities.com/Athens/Forum/6727>

Discipline-Specific & General-Reference Websites

The following is just a sampling of the types of sites you may find through general searches and use of the mega-sites. Again, bear in mind that a single Mega-Website such as Kathy Schrock's may provide organized links to many, if not most, of these sities. Thus, you would need to save (*bookmark*) the URLs for only one or two Mega-Websites rather than for dozens and dozens of smaller sites.

Dental

About.com: Dentistry
<http://dentistry.about.com/health/dentistry>

Ask NOAH About: Adult & Pediatric Dentistry
<http://www.noah.cuny.edu/dental/dentistry.html>

Dental Blue Book
<http://www.dentalbluebook.com>

Dental Education Resources
<http://www.derweb.ac.uk>

Dental Hygiene & Dental Technology Websites
<http://www.lib.siu.edu/websites/health/dental.html>

Dental Hygiene Links
<http://home1.gte.net/jonmarg/dhlinks.htm>

Dental Links
<http://www.global-dental.com/dentallinks.html>

Dental Site: Resources for Dental Assistants
<http://www.dentalsite.com/assistants>

Dental X Change
<http://www.dentalxchange.com>

Dentistry 2000: Resources for Dentists & Patients
<http://www.dentistry2000.com>

E-dental.com: Virtual Community
<http://www.e-dental.com>

Hardin Meta Directory: Dentistry
<http://www.lib.uiowa.edu/hardin/md/dent.html>

HealthWeb: Dentistry
<http://www.lib.umich.edu/libhome/hw/dent>

Healthy Teeth: Oral Health Education Database
<http://www.healthyteeth.org>

MedWebPlus: Dentistry
<http://www.medwebplus.com/subject/Dentistry.html>

Mosby: Dental Community
<http://www.mosby.com/communities/Dental/hcomd_cat.html>

Virtual Dental Center: Martindale's Health Science Guide
<http://www-sci.lib.uci.edu/HSG/Dental.html>

Medical / Health & Fitness

About.com: Health/Fitness
<http://home.about.com/health>

Achoo: Healthcare Mega-Site
<http://www.achoo.com>

AMA Personal Nutritionist
<http://www.ama-assn.org/insight/yourhlth/pernutri/checkeat.htm>

America's Doctor
<http://www.americasdoctor.com>

America's Health Network
<http://www.ahn.com>

Ask the Doctor
<http://www.bethisraelny.org/interactive/askdoctor.html>

Cancer News on the Net
<http://www.cancernews.com>

Cancer Treatment Centers of America
<http://www.cancercenter.com>

CBS HealthWatch
<http://www.cbs.medscape.com>

CenterWatch: Clinical Trials Listing Service
<http://www.centerwatch.com>

Discovery Health
<http://www.discoveryhealth.com>

Dr. C. Everett Koop
<http://www.drkoop.com>

Epidemic: A Fred Friendly Seminar
<http://www.pbs.org/fredfriendly/epidemic>

Family Doctor
<http://www.familydoctor.org>

Federal Consumer Information Center: Health
<http://www.pueblo.gsa.gov/health.htm>

5-a-Day Online Tracking Chart
<http://5aday.nci.nih.gov>

Glencoe Online Health
<http://www.glencoe.com/sec/health>

Hardin MD: Meta Directory of Internet Health Sources
<http://www.lib.uiowa.edu/hardin/md>

Health Care Report Cards
<http://www.healthgrades.com>

Healthfinder
<http://www.healthfinder.gov>

HealthGate
<http://www.healthgate.com>

Health Network
<http://www.ahn.com>

HealthSCOUT
<http://www.healthscout/com>

HON Code of Conduct for Medical & Health Websites
<http://www.hon.ch/HONcode/HONcode_check.html>

InteliHealth Professional Network
<http://ipn.intelihealth.com>

Interactive Patient
<http://medicus.marshall.edu/medicus.htm>

KidsHealth
<http://www.kidshealth.org>

Mayo Clinic Health Oasis
<http://www.mayohealth.org>

Med Explorer: Health Mega-Site
<http://www.medexplorer.com>

MedFacts Interactive
<http://www.medfacts.com>

Medical Matrix: Health Mega-Site
<http://www.medmatrix.org>

MedicineNet
<http://www.medicinenet.com>

MedNets
<http://www.internets.com/mednets>

Medscape
<http://www.medscape.com>

Medscape Nursing
<http://www.medscape.com/Home/network/nursing/nursing.html>

Merck Topics for Health Care Professionals
<http://www.merck.com/pro>

Mosby: Nursing Community
<http://www.Mosby.com/flat/hcomm.html>

National Institutes of Health: Health Information
<http://www.nih.gov/health>

National Library of Medicine
<http://www.nlm.nih.gov>

New Hampshire Med Net
<http://www.nhmednet.org>

NOAH: New York Online Access to Health
<http://www.noah.cuny.edu>

Nursing Center
<http://www.NursingCenter.com>

Nursing Net
<http://www.nursingnet.org>

OncoLink
<http://cancer.med.upenn.edu>

On Health
<http://www.onhealth.com>

Pharmaceutical Information Network
<http://www.pharminfo.com>

Phys: Health & Fitness Resource
<http://www.phys.com>

PlayDoctor: The Interactive Discovery Learning Experience
<http://www.medfacts.com/admit.htm>

Prevention
<http://www.healthyideas.com>

PBS TeacherSource: Health & Fitness
<http://www.pbs.org/teachersource/health.htm>

RxList: Internet Drug Index
<http://www.rxlist.com>

Science.Komm: Life Science & Medical Directory
<http://www.sciencekomm.at>

Shape Up America!
<http://www.shapeup.org>

ThriveOnline
<http://www.thriveonline.com>

U.S. Consumer Gateway: Health
<http://www.consumer.gov/health.htm>

Video Surgery Interactive: Health Information
<http://www.mindspring.com/~videosur>

Virtual Hospital
<http://www.vh.org>

Virtual Medical Center
<http://www.mediconsult.com>

Virtual Medical Center: Martindale's Health Science Guide
< http://www-sci.lib.uci.edu/HSG/Medical.html>

Virtual Nursing Center
<http://www-sci.lib.uci.edu/~martindale/Nursing.html>

WebMD
<http://www.webmd.com>

WebMD Health
<http://my.webmd.com>

WebRN
<http://www.webmd.com/rn>

WellnessWeb: The Patient's Network
<http://www.wellweb.com>

Women's Health & Medical Info
<http://www.cbull.com/health.htm>

Worldwide Nurse
<http://www.wwnurse.com>

YourHealth
<http://www.yourhealth.com>

YourSurgery: Synopses of Surgical Procedures
<http://yoursurgery.com>

Medical Dictionaries Online

Infomedical: Online Dictionary Links
<http://home.ipoline.com/~guoli/home/in_dict.htm>

MPIP Medical Dictionary
<http://www.mpip.org/frameset.shtml?tools/dict>

National Health Organizations

Action on Smoking and Health
<http://ash.org>

Administration on Aging
<http://www.aoa.dhhs.gov>

Agency for Health Care Policy and Research (AHCPR)
<http://www.ahcpr.gov>

Alcoholics Anonymous
<http://www.alcoholics-anonymous.org>

Al-Anon/Alateen Family
<http://www.al-anon.alateen.org>

American Academy of Pediatrics
<http://www.aap.org>

American Cancer Society
<http://www.cancer.org>

American Dental Association
<http://www.ada.org>

American Heart Association
<http://www.americanheart.org>

American Lung Association
<http://www.lungusa.org>

American Medical Association
<http://www.ama-assn.org>

American Optometric Association
<http://www.aoanet.org>

American Society for Nutritional Sciences
<http://www.faseb.org/ain>

Asthma and Allergy Foundation of America
<http://www.aafa.org>

Centers for Disease Control and Prevention
<http://www.cdc.gov>

March of Dimes Birth Defects Foundation
<http://www.modimes.org>

Mothers Against Drunk Driving
<http://www.madd.org>

National Cancer Institute
<http://cancernet.nci.nih.gov>

National Center for Health Statistics
<http://www.cdc.gov/nchs>

National Clearinghouse for Alcohol and Drug Information
<http://www.health.org>

National Council on Alcoholism and Drug Dependence
<http://www.ncadd.org>

National Dairy Council
<http://www.dairyinfo.com>

National Health Information Center
<http://nhic-nt.health.org>

National Institute of Allergy and Infectious Diseases
<http://www.niaid.nih.gov>

National Institute of Arthritis and Musculoskeletal and Skin Diseases
<http://www.nih.gov/niams>

National Institute of Mental Health
<http://www.nimh.nih.gov>

Office on Smoking and Health
<http://www.cdc.gov/nccdphp/osh >

United Cerebral Palsy Associations
<http://www.ucpa.org>

U.S. Food and Drug Administration
<http://www.fda.gov>

U.S. Food, Nutrition, and Consumer Services
<http://www.fns.usda.gov/fncs>

Science

Bill Nye the Science Guy's Nye Labs Online
<http://nyelabs.kcts.org>

AP & Other Biology Links
<http://step.sdsc.edu/personal/vanderschaegen/home/links.html>

Cells Alive
<http://www.cellsalive.com>

Chemistry Teacher Support
<http://www.lynx-ltd.org/chemistry>

Discovery Channel Online
<http://www.discovery.com>

Environment, Health & Safety
<http://www-ehs.ucsd.edu>

Ethical, Legal & Social Issues in Science
<http://www.lbl.gov/Education/ELSI/ELSI.html>

Exploratorium Science Snacks
<http://www.exploratorium.edu/snacks>

How Stuff Works
<http://www.howstuffworks.com>

How Things Work
<http://rabi.phys.virginia.edu/HTW>

Human Anatomy Online
<http://www.innerbody.com/htm/body.html>

K-12 Science Resources & Tools
<http://www.awesomelibrary.org/science.html>

Mr. Warner's Cool Science
<http://www3.mwis.net/~science>

NASA Space Science News
<http://science.nasa.gov>

National Energy Foundation
<http://www.xmission.com/~nef>

National Science Foundation
<http://www.nsf.gov>

PBS Online: Science
<http://www.pbs.org/neighborhoods/science>

PBS TeacherSource: Science & Technology
<http://www.pbs.org/teachersource/sci_tech.htm>

A+ Math
<http://www.aplusmath.com>

Algebra Activities
<http://www.visi.com/~dethier/activities.htm>

Geometry Center
<http://www.geom.umn.edu>

Gomath: Online Tutoring
<http://www.gomath.com>

History of Computing Devices in Mathematics
<http://www.llcc.cc.il.us/dbeverid/history.htm>

Math Archives
<http://archives.math.utk.edu>

Math Forum
<http://mathforum.com>

Math Goodies: Interactive Math Lessons with a Problem-Solving Approach
<http://www.mathgoodies.com>

Math: Resource Mega-Site
<http://www.csun.edu/~vceed009/math.html>

MathWorld Interactive
<http://mathforum.com/~carolm>

Mathematical Resources K-12: One-Stop Mega-Site
<http://members.stratos.net/jetta/math1.html>

MEGA Mathematics
<http://www.cs.uidaho.edu/~casey931/mega-math>

Nasdaq Web Site
<http://nasdaq.com>

PBS TeacherSource: Math
<http://www.pbs.org/teachersource/math.htm?default>

PC Quote Online
<http://www.pcquote.com>

Probability Central
<http://library.thinkquest.org/11506>

Virtual Library: Mathematics
<http://www.bergen.org/AAST/Virtual-Library/bmath.html>
<http://www.math.fsu.edu/science>

Science & Math	Cornell University Math & Science Gateway <http://www.tc.cornell.edu/Edu/MathSciGateway>
	Eisenhower National Clearinghouse for Mathematics & Science Education <http://www.enc.org/nf_index.htm>
	Links to Selected Resources <http://www.accessexcellence.com/RC>
	NSTA Science & Math Links <http://www.nsta.org/onlineresources/links>
	SciEd: Science & Mathematics Education Resources <http://www-hpcc.astro.washington.edu/scied/science.html>
	Seaborg Center for Teaching & Learning Science & Mathematics <http://seaborg.nmu.edu>
	Science Service <http://www.sciserv.org>
	TERC: Hands-on Math & Science Learning <http://www.terc.edu>
Communications English	Author Webliography <http://www.lib.lsu.edu/hum/authors.html>
	Bartlett's Familiar Quotations <http://www.columbia.edu/acis/bartleby/bartlett>
	DoubleTake: Teaching Narrative Across the Curriculum <http://www.doubletakemagazine.org/teachersguide>
	English Teacher's Companion <http://www.englishcompanion.com>
	English Teachers' Web Site <http://www.mlc.vic.edu.au/english>
	English Teaching in the UK <http://www.gosford-hill.oxon.sch.uk/etuk/etuk.htm>
	Focusing on Words <http://www.wordfocus.com>
	Guide to Grammar and Writing <http://webster.commnet.edu/hp/pages/darling/original.htm>

Internet Haiku Salon
<http://cc.matsuyama-u.ac.jp/~shiki>

Internet Poetry Archive
<http://metalab.unc.edu/ipa>

Literature E-texts
<http://etext.lib.virginia.edu/english.html>

Middle English E-texts
<http://etext.virginia.edu/mideng.browse.html>

On-Line Books Page
<http://www.cs.cmu.edu/People/spok/aboutolbp.html>

Online Library of Literature
<http://www.literature.org>

On-Line Reference Books for Medieval Studies
<http://orb.rhodes.edu>

Online Resources for Writers
<http://www.english.uiuc.edu/cws/wworkshop>

Only a Matter of Opinion: Writing Opinion Pieces
<http://library.thinkquest.org/50084>

Outta Ray's Head
<http://www3.sympatico.ca/ray.saitz>

PBS TeacherSource: Arts & Literature
<http://www.pbs.org/teachersource/arts_lit.htm>

Shakespeare
<http://www.shakespeare.com>
<http://www.shakespearemag.com>

Take Our Word for It: Weekly Word-Origin Webzine
<http://www.takeourword.com>

Word Detective
<http://www.word-detective.com>

Wordsmyth Dictionary-Thesaurus
<http://www.wordsmyth.net>

Writes of Passage
<http://www.writes.org>

Virginia's Poetry Page
<http://www.gondar.co.uk/poetry>

General Reference Tools & Links

All-in-One Search Page
<http://www.AllOneSearch.com>

Digital Reference Services/Ask an Expert
<http://www.askanexpert.com>
<http://www.vrd.org>

Encyclopedia Britannica
<http://www.eb.com:180>

Federal Web Locator
<http://www.infoctr.edu/fwl>

Fedstats
<http://www.fedstats.gov>

FedWorld Information Network
<http://www.fedworld.gov>

FindLaw
<http://www.findlaw.com>

Internet Public Library Reference Center
<http://www.ipl.org/ref>

Internet Reference Links
<http://www.library.cornell.edu/okuref/select.htm#news>

Martindale's The Reference Desk
<http://www-sci.lib.uci.edu:80/~martindale/Ref.html>

My Virtual Reference Desk
<http://www.refdesk.com>

Southold Free Library
<http://sohd.suffolk.lib.ny.us/main.htm>

Statistical Resources on the Web
<http://www.lib.umich.edu/libhome/Documents.center/stats.html#doctop>

Study Skills Help Page
<http://www.mtsu.edu/~studskl>

U.S. Census Bureau
<http://www.census.gov>

WWW Reference Resources
<http://www.library.yale.edu/rsc/readyref>

Creating a Chapter Website

Beth Armstrong, a Medical Technologies teacher at Pioneer Career & Technology Center, discovered a free and user-friendly tool for creating a Website. Thanks to a partnership between Highwired.Net and SkillsUSA–VICA, local chapters can create their own Websites and join a national online SkillsUSA–VICA network. Through this network, chapters can link with other health occupations programs (and other student clubs) across the school, state, and nation and will receive news feeds from SkillsUSA–VICA headquarters. In addition, a calendar tool allows you to post key chapter events and deadlines on your Webpage, and Highwired.Net automatically includes all SkillsUSA–VICA dates on the calendar for you. There is no HTML required and no software to download.

To join, go to <http://www.highwired.net/Signup> and follow the simple instructions. If you have questions, contact Brett Dickens by phone (617-577-1500) or e-mail <bdickens@high-wired.net>.

Internet Aids

An indispensable resource for teachers using the Internet in the classroom is *From Now On:* The Educational Technology Journal. If you go to <http://www.fromnowon.org>, you can review issues of this e-journal ***online***, or you can subscribe to this free journal and receive a monthly issue by ***e-mail*** from September to June. The articles by the publisher, Jamie McKenzie, are thought-provoking and eye-opening. Be sure to read "Grazing the Net: Raising a Generation of Free Range Students," a delightfully written piece on how to guide students to becoming Internet *infotectives* "capable of asking great questions about data . . . in order to convert the data into information . . . and eventually into insight."

Other Internet aids you might want to check:

Beginner's Help
<http://www.webnovice.com>

Computer Virus Hoaxes & False Alerts
<http://www.datafellows.com/news/hoax.htm>

EdWeb
<http://edweb.cnidr.org>

Evaluating Web Resources
<http://www2.widener.edu/Wolfgramk-Memorial-Library/webeval.htm>

InternetBASICS
<http://www.augsburg.edu/library/aib>

Internet Navigation Tools
<http://riceinfo.rice.edu/Internet>

Learn the Net: Internet Guide & Tutorial
<http://www.learnthenet.com/english>

Link2Learn Professional Development
<http://L2L.ed.psu.edu>

Sites to Help You Study the Web Using the Web
<http://www.polaris.edu/iltli/WEB.htm>

tech LEARNING
<http://>www.techlearning.com

Webopedia: Online Computer Technology Encyclopedia
<http://webopedia.internet.com>

Web Page Construction Tutor
<http://www.bhs-ms.org/webhelp>

Website Construction Resources
<http://www.ilt.columbia.edu/k12/livetext/resources/wwwdev.html#design>

webTeacher: Your Source for Web Knowledge
<http://www.webteacher.org>

Additional References

For more information about the Internet, consider consulting some of the following sources:

Glavac, Marjan M. *The Busy Educator's Guide to the World Wide Web.* London, Ontario, Canada: NIMA Systems, 1998

A book written by an educator that emphasizes what the busy educator can use in the class **now**! Chapters include how to use the Internet—real fast; what's behind those links; sites that motivate, engage, and stimulate students (and educators); Internet projects that really work; searching and finding information for the busy educator; and publish or perish: no one knows what you've done until you've told them.

Morris, Evan. *The Book Lover's Guide to the Internet.* Reprint Edition. New York, NY: Fawcett Columbine, 1998.

Contains chapters on what the Internet is and where it came from, simple ways to connect yourself to the Internet, the many paths through the Internet, adding your two cents' worth, participating in mailing lists, publishing online, online resources for book lovers, and staying abreast of new resources on the Internet.

Williams, Bard. *The Internet for Teachers*, 3rd Edition, 1999.
Jasmine, Grace; and Jasmine, Julia. *Internet Directory for Teachers*, 1997.
Williams, Bard; and Kawasaki, Guy. *Web Publishing for Teachers*, 1997.

Part of the **For Dummies®** series from IDG Books Worldwide (Foster City, CA), these "lighthearted—but not lightweight"—books are clearly laid out, filled with useful tips and hints, and designed to address the particular needs of teachers. <http://www.dummies.com>

Tech Prep Curriculum Catalog <http://www.ohtpcs.org/tpcurr.htm>	The following resources are available to Ohio teachers for 2-week loan from the Tech Prep Collection at the Center on Education and Training for Employment, 1900 Kenny Road, Columbus. Contact Steve Chambers, librarian, by e-mail <chambers.2@osu.edu> or by phone: 614-292-6991; or 800-848-4815, ext. 2-6991.
TP 001 038	*Online Classroom: Teaching with the Internet*
TP 001 039	*The Internet and the K-12 Classroom*
TP 001 062	*Learn How to Use Netscape Navigator* (VHS videotape)
TP 001 076	*Global Quest: The Internet in the Classroom* (VHS Videotape & Computer Software: Mac and Windows versions)
TP 001 077	*Educator's Internet Companion: Classroom Connect's Complete Guide to Educational Resources on the Internet*
TP 001 230	*Education on the Internet: Hands-on Book of Ideas, Resources, Projects, and Advice*
TP 001 231	*Educator's World Wide Web Tour Guide: A Graphical Tour of Over 200 Educational Treasures on the World Wide Web*
TP 001 234	*Teaching & Learning with the Internet: Facilitators Guide*
TP 001 235	*Teaching & Learning with the Internet:, No. 1* (VHS videotape)
TP 001 236	*Teaching & Learning with the Internet:, No. 2* (VHS videotape)
TP 001 277	*Educator's Information Highway*

Insert the
"Curricular Resources for
Applied Academics"
Tab Here

Curricular Resources for Applied Academics

Clearly, there are hazards inherent in any resource list. For one thing, no sooner is it developed than it is out of date. Moreover, publications go out of print, may be expensive, or may be hard to find. So, here are some suggestions for using the following resource list wisely.

- ***Be aware that some academic content—particularly in the sciences—is an inherent part of health services programs.*** Therefore, it is essential that applied academics teachers coordinate the use of health-specific texts—or the activities within them—with the health services teachers to avoid duplication.
- ***Be on the lookout for new materials.*** The resources that follow should be taken as examples of the types of materials that are out there—some for student use, some for teacher reference. By contacting the publishers listed—publishers who seem committed to supporting integrated, applied, hands-on instruction—you can easily get an up-to-date catalog of available materials. Information for contacting these publishers via phone, fax, e-mail, or Internet is provided at the end of this section.
- ***Don't ignore older material.*** Just because particular materials are no longer available from a publisher doesn't mean they no longer exist. If you are trying to develop integrated curricula for your program, it can be very useful to have access to a variety of resources, whether they are still for sale or not. Check your school, district, college/university, city, or state libraries for sources of interest on this list.

  You will note that some materials carry a TP #. These are materials that are part of Ohio's Tech Prep Library located at the Center on Education and Training for Employment, 1900 Kenny Road, Columbus. The collection contains over 1,900 items at present, each of which was selected based on reviews by academic and vocational teachers, counselors, and administrators in Tech Prep programs. These materials are available to Ohio educators on a 2-week free loan basis.

Ohio Tech Prep
Curriculum Services
<http://www.ohtpcs.org>

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ERIC/CSMEE
<http://www.ericse.org>

ENC Online
<http://www.enc.org>

- *Use the CETE library.* Better still, visit the collection at the CETE library so you can browse. The texts listed in this section focus on applied academics, but the collection also contains a wealth of technical texts. If you are an applied academics teacher wanting to learn more about the occupational areas of your students, there are many excellent texts here that could be of help. What's more, if you are an applied science teacher, the ERIC Clearinghouse for Science, Mathematics, and Environmental Education (ERIC/CSMEE) and the Eisenhower National Clearinghouse for Mathematics and Science Education (ENC) are located right across the street at 1929 Kenny Road, Columbus.
- *Utilize major and minor publishers.* The focus of the listing is on sources other than major publishers (although some major publishers are represented). The reasons are several. One is that major publishers do a good job all by themselves of promoting their products in the schools. A second is that the names of and contact information for major publishers tends to be a slippery issue these days. They merge a lot. One day you have Addison Wesley and Longman, the next you have Addison Wesley Longman. If you have access to the World Wide Web, use of a search engine will quickly locate most major and many minor publishers for you, referring you to a publisher's new name and Web address if there's been a change. Many publishers have catalogs online or a button you can click to have a print catalog sent to you.
- *Watch for icons signalling media other than texts.* The listing includes videos, audiocassettes, read-only compact discs (CD-ROM) and software. These are represented by the icons shown in the margin.

Videos

Audiocassettes

Compact discs

Software

Please Note: In most cases, the annotations have been drawn from descriptions provided by the developers or publishers, and no endorsement of the products is intended.

Applied Communications, Mathematics, and Science

Career Communications, Inc.

✓ *American Careers*

This **magazine**, produced three times a year, provides content of high interest to vocational students, and its articles lend themselves to use in applied academics classes. In fact, applied math, science, and communications are a focus of the magazine's writers, and Learning Guides available for each issue specify how the articles relate to state standards and SCANS skills. Student activities are also suggested.

For example, issues in 1998-99 included articles on health careers, forensic science, occupational therapy, and pharmacy. Such articles could be used in applied communications classes, with students being asked to summarize or paraphrase what they've read; conduct research on specific elements in the article and report on what they find; debate key issues presented; and so on. In applied mathematics, students could be asked to compile the statistics presented into a chart or graph or to use the statistics to make predictions. For applied science, one of the student activities suggested for the article on forensics is as follows:

> Set up culture tubes or porcelain spot plates to screen given over-the-counter drugs (e.g., aspirin, acetaminophen, caffeine) for color analysis. Prepare three test reagents (nitric acid, tannic acid, marquis) for each substance, and then add the substance to the reagent. Observe carefully both color reactions and patterns of interaction for each questioned substance. Prepare a description that includes detailed observations of each substance in each reagent.

A table presenting data on 51 fast-growing millennium jobs, average salary per year for each, and education/training needed could be the basis for a variety of math activities. Want students to appreciate the role geometry plays in the world of work? How about an article on unusual careers for

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people who love shapes—one in which a LEGO® block model builder says, "Just try building a motorcycle wheel or a sphere out of a little square block, and you'll see where the math comes in handy."

Math and science skills needed in the real world have been covered in such articles as "Creative Careers That Demand Math and Science Skills," "Calculate the Value of Math and Science Careers," and "What Do Math and Science Have to Do with Life Anyway?"

Ohio Agricultural Education Curriculum Materials Service

✓ *Teaching for Connection: Critical Thinking Skills, Problem Solving, and Academic and Occupational Competencies*
This is an excellent source for vocational teachers wishing to integrate academic competencies and activities requiring critical thinking and problem solving into their lessons. The text begins with a 20-page introduction explaining the text's philosophy, detailing the steps in the lesson development process, and providing a sample lesson plan format. The bulk of the publication, then, comprises sample **lesson plans** from a variety of vocational service areas.

EDINFO Press

✓ *Critical Thinking, Reading, and Writing*
The practical classroom activities in this document encourage reading, writing, and thinking in a critically reflective, inventive way for students at all levels and across most subjects. Secondary-level activities include identifying frames of reference; critical reading in relation to newspapers, junk mail, and television; research-oriented writing; and study guides focused on examination of moral issues.

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✓ *Reading and Writing across the High School Science and Math Curriculum* TP 001 043

To counteract the breakdown between scientific thinking and the intelligent use of language, the author compiled a collection of **lesson plans** drawn from tried and tested material in the ERIC database. These lessons help you build good language usage into your already existing science and math curriculum. The plans are grouped into the following topics: writing science, reading science, wording science, short scientific writing assignments, long scientific writing assignments, science and imagination, and analogical reasoning—from science and math to world and ideas, and back again. Math is incorporated within these "science" topics.

✓ *Writing across the Curriculum Leader's Manual* TP 001 044

This workshop manual presents a writing program designed to be incorporated in all content areas without disrupting teachers' established syllabi or adding significantly to teachers' already heavy schedules and workloads. Leader notes (including discussions of the pertinent literature and answers to the most commonly asked questions), group discussion, activities, and overhead transparencies are arranged sequentially for a step-by-step, page-by-page presentation. The manual is loaded with activities for content-area teachers to try out in the workshop setting. It is recommended that the workshop participants supplement this material with the book *Writing Is Learning* by Howard Willis.

✓ *Writing Is Learning: Strategies for Math, Science, Social Studies, and Language Arts*

Writing is an effective tool for teaching in any content area—and a powerful way to make students active participants in their own learning. Writing activities in this document include journals, problem solving, writing "from the future," summaries, narratives, definitions, reviews, and letter writing.

Virginia Vocational Curriculum and Resource Center

✓ *Collaborative Lesson Plans '96, '97, and '98*
Developed by Virginia teachers, these collections of **lesson plans** provide innovative, challenging ideas for integrating academic (math, science, English, and history/social studies) and vocational disciplines. Available on DOS-formatted disks.

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Applied Communications

Agency for Instructional Technology (AIT)

Samples TP 000 795-796

✓ *Applied Communication*

Each of the 17 modules in this **package** consist of ten activity-oriented lessons that apply reading, writing, listening, speaking, and problem solving to on-the job situations in five major occupational areas, including health occupations. Materials in this package include instructor's kit, instructor's guide, worktext, and videocassette. The two sample modules in the Tech Prep collection focus on technical writing and electronic communication.

✓ *Get Writing!*

The five video programs and a workbook in this **package** are designed to develop students' ability to put together clear, concise paragraphs that can be used to complete job applications, write business or family letters, and present reports on the job.

American Management Association (AMACOM)

✓ *The AMA Handbook of Business Letters, 2nd ed.*

Succinct guidelines on grammar and style, plus hundreds of model letters for every business situation, are included in this handbook. In addition, the book's 320 pretyped letters are ready-to-go, or to tailor as needed, by slipping the enclosed diskette into any computer.

✓ *The AMA Style Guide for Business Writing*

A style guide developed exclusively for business writers, this comprehensive resource features guidelines on the full range of business communications, formats, preferred usages, and other issues that arise in the creation of memos, reports, newsletters, and speeches. Information is arranged alphabetically and copiously cross-referenced.

BEST COPY AVAILABLE

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Aspen Publishers

✓ *Communication Skills for the Health Care Professional: Concepts and Techniques*
Introduces patient and professional communication issues and focuses on cultural sensitivity and competency, as well as patient-focused communication. Includes a section on communication in difficult circumstances and real-life examples and sample dialogue to show exactly how communication techniques can be applied in daily health care situations.

Association for Career and Technical Education (ACTE)

✓ *The Art of Workplace English*
Theory and practice are blended to show how workplace skills and scenarios can be integrated into the traditional English classroom—and why they should be. Filled with suggested classroom activities and ideas for developing industry-relevant curriculum.

Butterworth-Heinemann

✓ *Heineman Dental Dictionary, 4th ed.*
This occupational dictionary could provide the basis for vocabulary development and other applied communications activities.

Cambridge Educational

✓ *Constructive Communications: Talking Your Way to Success*
This 30-minute video uses entertaining vignettes to demonstrate a process for effective communication, including how to identify the effect you hope to achieve, understand the knowledge and attitude of the audience, explain your subject with specific and organized information, and see the positive effects of knowing and understanding yourself.

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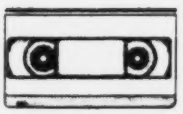
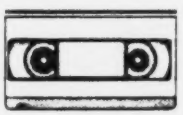
✓ *Effective Listening Skills: Listening to What You Hear*
Listening, which may be the most essential communication skill of all, is the focus of this 30-minute video. Students learn the benefits of listening and master the skills by deciding to listen, reading all stimuli, investing spare time wisely, verifying what they hear, and expending energy.



✓ *Writing for Results: The Winning Written Report*
The importance of good writing skills to job entry and job success is stressed in this 30-minute video. The process presented shows how to analyze your prospective reader; determine the report's purpose; select and narrow the topic; gather, record, and file information; organize the paper; provide concrete and specific supporting material; proofread and revise; and prepare the final product.



CareerTrack Publications

✓ *Assertive Communication Skills for Professionals*
These four videos, supported by an audio/video workbook, help students learn to communicate powerfully in a style that is comfortable. They define assertive behavior, tell how to build an assertive foundation, introduce the assertiveness toolbox, and explain how to put assertiveness to work. Engaging role-play vignettes and practice exercises are included.

TP 000 547-551

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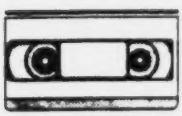
Communication Briefings

TP 000 601-610



- ✓ *Everyone's Customer-Service Role*
- ✓ *Getting the Most Out of Your Meetings*
- ✓ *Solving People-Problems on the Job*
- ✓ *Make Presentations Work for You*
- ✓ *Communicating with Customers*
- ✓ *Get More Done in Less Time*
- ✓ *Communicating with People on the Job*
- ✓ *Listening: The Key to Productivity*
- ✓ *Make the Phone Work for You*

A series of videos (average length = 15 minutes) designed to help develop workplace communication skills. Two additional videos not included in the Tech Prep collection cover *Better Business Grammar* and *Mastering Memos.*

Contemporary Books

TP 000 628

- ✓ ***Essential Skills for the Workplace (Level One): Obtaining Information and Using Resources***

Text covers telephone messages, reference materials, policy manuals, charts and tables, product information for selling, product information for purchasing, mileage charts and transportation schedules, shipping and receiving documents, and measurements (e.g., of size and space, weight, pressure, temperature, time, and money).

TP 000 627

- ✓ *Essential Skills for the Workplace (Level One): Using Forms and Documents*

Text covers personal forms, paychecks, credit, application and training forms, certification and licensing forms, starting a job, time sheets, benefits on the job, order forms, billing forms, contracts and agreements, warranties, and legal notices.

TP 000 618

- ✓ *Expressions: Stories and Poems*

This collection of 20 unabridged stories and poems showcases a wide range of writing styles for student interpretation.

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✓ *Viewpoints: Nonfiction Selections* TP 000 619

Contains over 20 short pieces of nonfiction (both excerpts and full length) that focus on timely themes such as family relationships, humor, personal freedom, employment, and war.

✓ ***Communication Skills That Work: A Functional Approach for Life and Work*** TP 000 623-624

Book One covers giving and following directions; gathering information; stating a viewpoint; writing labels, lists, and notes; and filling out charts and forms. Book Two covers listening and speaking effectively, asking questions and giving directions, interviewing techniques, and writing memos and business correspondence.

✓ ***Reading Skills That Work: A Functional Approach for Life and Work*** TP 000 621-622

Book One covers building vocabulary, interpreting graphics, following directions and procedures, skimming and scanning for information, and developing reference skills. Book Two covers interpreting and summarizing written materials, evaluating information and drawing conclusions, classifying and prioritizing information, researching a task, and working and problem solving as a team.

Curriculum and Instructional Materials Center—Oklahoma

CIMC's English series was designed to reinforce basic skills concepts through practical exercises and practice. Emphasis is placed on functional literacy. Titles include the following:

✓ *English: Volume II*

Contents provide related vocational information, employability skills, personal development, writing skills, parts of speech, library skills, practical usage, and life skills. Text is supported by 36 transparency masters, 3 job sheets, and 144 assignment sheets.

✓ *Parts of Speech*

Text covers nouns, pronouns, conjunctions and interjections, prepositions, adjectives, and adverbs.

✓ *Introduction to Writing*

Contents focus primarily on the writing of sentences. Text is supported by 24 assignment sheets.

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Delmar Publishers

TP 000 020

✓ *Communicating in Business and Industry, 2nd ed.*
Designed to help students master the verbal and nonverbal communication skills essential for success in modern business and industry settings. Covers reading, writing, listening, telephone, and computer skills, as well as such topics as fax and cellular communication, desktop publishing, time management, and innovative problem solving.

✓ *Dental Terminology*
Another terminology text that could be used to support occupation-specific applied communications activities. Terms are organized by specialty, and a 60-minute audiotape provides actual pronunciations and definitions of key terms.

TP 000 011

✓ *Medical Terminology for Health Professions, 2nd ed.*
Medical terminology is taught through a combination of anatomy and physiology, word-building principles, phonetic pronunciations, and application exercises. A set of 128 flash cards in the back of the book provide additional practice with word parts.

✓ *Terminology for Allied Health Professionals*
Real-life medical reports are included and terminology is presented in context, providing a rich source of authentic materials that can be used to create activities for applied communications classes. Practice Software (3.5 Windows) includes exercises, activities, pronunciation of terms, and games.

TP 000 008

✓ *Therapeutic Communications for Allied Health Professions*
Written for students in medical assisting and other allied health programs, this text covers communications, human growth and development, and therapeutic response. Emphasis is placed on developing a solid understanding of self and others in order to help clients with different needs. The text presents a wide variety of client situations and appropriate therapeutic responses, including caring for patients who are stressed and anxious, depressed, suicidal, drug dependent, and those with AIDS.

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Glencoe/McGraw-Hill

✓ *Editing and Proofreading* TP 001 184-185

Includes a student workbook and teacher's annotated edition focusing on fundamental editing and proofreading skills.

✓ *Gregg Reference Manual* VT 040 708

Although the publisher insists on listing this text only in its Business Reference Texts—rather than English Texts—section, it is in fact the single best reference for grammar, style, and usage questions that this writer/editor/former English teacher has ever encountered. This is the handbook that is always at my fingertips. The explanations of the "rules" are simple and clear, each supported with very helpful samples of right and wrong. The index is extensive, allowing you to find the rule you want. Contents cover punctuation; capitalization; numbers; abbreviations; plurals and possessives; spelling; compound words; word division; grammar; usage; editing, proofreading, and filing; letters and memos; reports and manuscripts; notes and bibliographies; tables; other business documents; and forms of address. Glossaries present grammatical terms and computer terms. Two supplementary volumes of worksheets are available to provide students with practice in applying the rules.

✓ *Writer's Choice: Composition and Grammar Series (9-12)*

The communication skills of writing, speaking, listening, and thinking are integrated in this text. Case studies that show how writers handle real-life writing projects are provided to give students a chance to role-play, think critically, and write. Each composition lesson ends with a full page of guided, cross-curricular, and open assignments, allowing for varying levels of self-direction. Each grammar, usage, and mechanics unit ends with a *Workshop* feature, which reinforces the relationship between these topics and the worlds of writing and literature. Literature selections in each composition unit reflect the quality and diversity of professional writing today.

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Great Source, Houghton Mifflin

✓ *Daybooks of Critical Reading and Writing, Levels 9-12*
With a journal-style design and voice that speaks to students, this series goes beyond the traditional anthology to provide a focused link between reading and writing in a form students respond to and teachers find manageable. Learners respond to literature directly on the page to encourage active, analytical reading. Each level includes 80 lessons.

✓ *Oxford School Shakespeare*
Each of the 14 plays in this series includes the complete and unabridged text of the play, as well as all the tools students need to understand it. Extensive notes included alongside the text provide detailed explanations of difficult words and passages, plot synopses, summaries of individual scenes, and character notes. Also included are biographical information on Shakespeare, historical background of England during Shakespeare's time, character studies, and projects.

✓ *Reading and Writing Sourcebooks, Levels 9-12*
Designed for struggling readers, these texts feature classic and contemporary literature selections, supported by direct reading and writing instruction. With a journal-style design, the sourcebook at each level includes 24 literature selections.

TP 000 412

✓ *Writer's INC: A Student Handbook for Writing & Learning*
A stunning paperback book (in this writer's opinion) that supports integration at a variety of levels. Instead of separate grammar, literature, speech, and composition texts, this book blends it all under one cover, producing a true ***handbook*** for students as they work on their communication skills across subjects. The major sections address the writing process, basic elements of writing, searching and researching, forms of writing, writing about literature, reading and study skills, and speaking and thinking.

These are further supported by a *Proofreader's Guide* to grammar and style and an *Almanac* with full-color maps, traffic signs, periodic table of elements, U.S. Constitution, parliamentary procedures, multiplication and division tables, weights and measures, metric system, planets, U.S. Presidents and Vice Presidents, and historical time line.

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There are no traditional assignments or exercises. Instead, this is a "portable" guide to students' own writing and learning. The instruction is supported with lots of actual good and bad examples of writing—some from well-known authors, some from published works by student writers. A teacher's guide is available to support use of the text.

✓ *Writer's INC. School to Work: A Student Handbook*
This is very much like the handbook described previously, with the same rigor, but the writing samples focus more on workplace writing and speaking and less on creative writing. Major topics include the communication process; the writing process; basic elements of writing; forms of writing; writing in the workplace; research writing; searching for information; speaking and listening; issues in the workplace; and reading, thinking, learning.

✓ *Daily Language Workouts*
This flexible teacher's resource includes high-interest language activities designed to help students develop their editing and proofreading skills. The activities are short and fun, take only a few minutes of class time, yet pack a lot of punch. They can be used for oral or written practice to pump students up for effective communication. Activities include daily *MUG Shots* (sentences containing language blunders in ***m***echanics, ***u***sage, and ***g***rammar for students to identify and fix); weekly *MUG Shot Paragraphs* to edit; daily writing practice activities in which writing prompts (photo, quote, graphic) inspire free writing on a variety of topics; sentences for modeling and expanding, penned by well-known writers; and show-me sentences, which give students starting points for writing strong, active sentences.

✓ *Writer's Files: Grades 9-12* TP 000 476-479
The Writer's File for each level provides a sequence of reproducible writing and language activities that can serve as the focus of a new and stimulating writing program when used in conjunction with *Writer's INC* or as a supplement in an existing program. Provided for each level are 18 "sequential" writing activities; 50 or 60 writing workshops; over 200 daily language activities; and numerous reproducible forms, strategies, and resources.

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Mosby

✓ *Basic Healthcare Terminology: With Anatomy Coloring Exercises*

A good text for integrating health, communications, and science, this programmed terminology book focuses on anatomy and physiology and contains strategies for reinforcing the study of terminology (e.g., coloring exercises, crossword puzzles, and problem solving).

✓ *Communications in Nursing: Communicating Assertively & Responsibly in Nursing, 3rd ed.*

Contains abundant examples of communication skills and techniques to help students first understand basic concepts of therapeutic communication and then apply them in different clinical situations. Includes two new chapters on communication technology and cultural communication, as well as increased content on communicating with the family, groups, children, the elderly, victims of abuse, and members of the interdisciplinary health care team.

✓ *Mosby's Medical, Nursing, & Allied Health Dictionary, 5th ed.*

This is a winner. Thousands of entries cover all areas of nursing, medicine, and allied health, including entries for 5,000 new terms. Over 2,300 full-color photographs and line drawings enhance the definitions. A total of 74 appendixes provide reference material, including information on units of measurement; symbols and abbreviations; prefixes, suffixes, and roots; guidelines for relating to patients from different cultures; normal reference values; clinical calculations; nutrition; a vivid, 43-page color atlas of human anatomy that labels the components of all body systems; and much, much more.

Paradigm Publishing, Inc.

TP 000 691-692

✓ *Business Writing: Integrating Process and Purpose, 5th ed.*

Teaches learners to focus on both the process and purpose of writing as they develop business documents, to pass on information, to respond to requests and questions, to request information or action, to direct, to persuade, and to sell self.

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✓ *Proofreading & Editing Business Documents, 2nd ed.* TP 000 794 and 799

Teaches how to locate and correct three types of errors—format errors or inconsistencies; typographical errors; and meaning, or content, errors—in short business documents, longer reports, and graphic-oriented pages or documents. Also covers light editing often associated with proofreading. Each chapter includes specific techniques, associated language/grammar skills, and a performance test. (Text and Instructor's Guide)

✓ *Reading for Workplace Success: General Business* TP 000 683-684

Teaches reading strategies and skills to prepare learners for problems they will encounter in training programs and on the job. (Text and Instructor's Guide)

✓ *Telephone Mastery: Skills for Business Productivity* TP 000 736-745

Teaches effective use of the telephone, stressing listening techniques, attitude, and voice control. Includes a performance checklist that can be used for student self-evaluation. The **package** includes text, instructor's guide, video, study guide, and six audiocassettes.

✓ *Telephone Techniques: Building Communication Skills* TP 000 739-745

This set of six audiocassettes, supported by an accompanying study guide, includes 22 activities focusing on voice, word, and listening power.

✓ *Writing for Workplace Success* TP 000 687-688

Develops students' abilities and knowledge of writing within a business and occupational context through problems set in an authentic workplace environment. The four units cover passing on information, responding to questions and requests, making requests, and reporting information. (Text and Instructor's Guide)

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South-Western Educational Publishing

- ✓ *American Literature for Life and Work*
- ✓ *British & World Literature for Life and Work*
- ✓ *Literature for Life and Work—Book 1*
- ✓ *Literature for Life and Work—Book 2*

These anthologies group the literature offerings into high-interest, relevant topics (e.g., community and responsibility, innocence and experience, choices and possibilities). Each grouping is followed by assignments requiring students to explore, understand, and connect. Students are invited to express their own views, share them with others, work on teams, and make a significant difference in the community. The lessons focus on personal and career/workplace applications, as well as "traditional" literary skills, and balance academic and vocational-technical skills. A cross-curricular feature—*Focus On*—integrates literature with other subject areas, including math, fine arts, history, and science. Workshops at the back of each text provide references for communication and writing skills. *Internet Activities* at <www.LitLinks.com> enhance selections and provide students with up-to-date information and additional resources.

- ✓ *The Art of Life: An Anthology about Life and Work*
- ✓ *The Art of Work: An Anthology of Workplace Literature*

These anthologies contain a collection of high-interest, quality readings linked to the Applied Communication curriculum. The contemporary and classical selections cover all genres and are balanced for multicultural and gender equity.

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✓ *Communicating for Success, 2nd ed.*

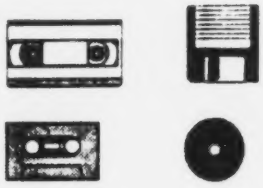
Three of the authors of this text hail from Ohio's Great Oaks Institute of Technology and Career Education. Lessons are not structured around traditional topics such as nouns, verbs, etc. Instead grammar, punctuation, and usage are addressed when they are important to a specific job-related task. Over 30 literature selections and related activities reinforce the practice skills taught within the chapters, and margin activities direct students to the Internet for more information and insight into chapter topics. Chapter topics include communicating at work, communicating definitions, listening and responding, giving instructions, describing a process, describing a mechanism, summarizing, using forms, communicating messages (memos, letters, and notes), persuading, applying for a job, comparing and contrasting, interviewing for information, using numbers and statistics, presenting reports, and becoming a professional. Also available to support the text are a student workbook, reproducible tests, an audio CD, template disk activities, PowerPoint presentations, and a computerized test bank.

✓ *Communication 2000*

The 14 modules in this totally flexible, multimedia system cover workplace communication, listening and speaking, workplace writing, information in the workplace, reading in the workplace, self-management, negotiation to solve problems, communicating with co-workers, communicating with customers, communicating with teams, diversity in the workplace, ethics in the workplace, technical communication, and effective presentations. Learner and instructor guides are supported by an interactive videodisc or videocassette, audiocassettes containing literature readings and related activities, and template discs containing files for student activities.

✓ *Communication for Health Services Careers*

Applies the successful communication topics explored in Communication 2000 to a specific career cluster, with career-specific applications throughout each lesson. Video segments include documentary "on the job" footage and interviews. An audiocassette provides listening activities to prepare students for a career environment. Selected lessons encourage students to surf the Internet for job search activities. Lessons cover reading in the workplace,



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graphic interpretation, listening at work, speaking at work, ethical decision making, workplace writing, and working in teams.

✓ *Global Shakespeare Series*

The series comprises *Introducing Shakespeare* on CD-ROM and four plays: *Hamlet, Macbeth, Romeo and Juliet,* and *Julius Caesar.* In addition to the inclusion of the complete, authentic text of each play, each volume contains a wide variety of related multigenre and multicultural readings to help students make connections between the work and their own lives. Vivid illustrations and marginal notes support student study of the text.

✓ *Media Matters: Critical Thinking in the Information Age*

This interactive, multimedia literacy kit—with print, video, audio, and online resources—helps students learn to think critically by analyzing the media from multiple perspectives and evaluating the messages they see and hear every day.

✓ *Reading for Success: A School-to-Work Approach*

This text uses an array of contemporary "how-to" and technical print materials to stimulate students' interest in becoming better readers of both textual and graphic materials.

✓ *Speaking for Success*

Whether talking person to person, in a group, or in front of an audience, students will get plenty of hands-on experience in effective communication using this text. Each chapter offers numerous applications and workshops, with a variety of career connections; readings, quotes, and famous speeches; workplace cases for discussion and evaluation; individual and group speaking assignments; model speeches and outlines; and practice activities. An instructor's manual, PowerPoint disk, and video supplement the text.

✓ *Technical Writing for Success: A School-to-Work Approach*

Both technical writing and technical reading are included in this engagingly written and highly practical book. Workplace competencies are built into each chapter, and a diskette provides additional reinforcement activities.

Applied Mathematics and Science

Curriculum Publications Clearinghouse— Illinois

✓ *Phys-Ma-Tech*

To encourage students who do not traditionally enroll in physics to do so, these activity-based materials integrate the academic content of three disciplines—physics, math, and technology—and relate it to real-world experiences. The materials—which are designed to improve high school physics without diminishing the content or rigor of the subject—expose students to a variety of technological devices, systems, and processes. The activities have been tested and can be used, adapted, or expanded for use in a variety of teaching contexts. A videotape is available to support the print materials.

Delmar

✓ ***An Integrated Approach to Health Sciences: Anatomy & Physiology, Math, Physics, & Chemistry***

Unique in its method, this text uses a fully integrated approach to the four basic building blocks of health sciences—anatomy and physiology, math, physics, and chemistry—and presents them in the context of health occupations. Theory, practical applications, and humor are combined in a readable format. Professional profiles highlight careers in health sciences. Exercises and case studies are included to improve critical thinking.

Glencoe/McGraw-Hill

✓ *Technology: Science and Math in Action*
Two Student Activity Texts, each containing five modules, present hands-on activities in which students use scientific and mathematical concepts to solve technological problems. Students do experiments, complete activity sheets, and design and build products. Career information and the history of technology are included. Topics include hydroponics, bridges, printed images, rockets, electricity, recycling, and videos.

✓ *Technology, Science, and Mathematics Connections Activities: A Teacher's Resource Binder*
Each activity in this Teacher's Resource Binder provides a technological problem to be solved and describes the technology, science, and mathematics applications students will use. The technology component provides guidance for designing, constructing, and evaluating a product. The science and mathematics components are related to the product and to real-world problems and situations. Math topics are correlated to NCTM standards. Topics include pollution-free vehicles, power boat, robotic transfer, and rocket payload.

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Applied Mathematics

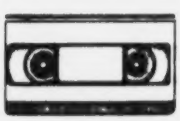
Agency for Instructional Technology (AIT)

✓ *Mathemedia*
This multimedia package (videos or laserdiscs, software, teacher's guide, and student guide) is designed to increase students' understanding of mathematics using context-based, problem-solving activities recommended by NCTM. *Mathemedia Software* links students to spreadsheet mathematics featuring real-world examples students can solve on the computer, while also learning the principles these problems demonstrate.

Association for Career and Technical Education (ACTE)

✓ *High School Mathematics at Work*
A collection of essays and examples places this "academic" subject—mathematics—where it truly belongs: in the context of the workplace and everyday life. Multi-part problems show the pervasiveness of math on the job and in daily tasks, from analyzing ambulance response and determining drug dosage to calculating the cost of carpeting and buying on credit.

✓ *Math . . . Who Needs It?*
Join host Jaime Escalante and guests Bill Cosby, Dizzy Gillespie, and Teri Garr on a wild ride through some of math's coolest real-world applications. Students will see that math can be accessible and fun, and that it's essential to everything from designing skateboards and roller coasters to sports and music careers.



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Cambridge Educational

✓ *Applied Math*
This software series was designed to enhance the nationally approved *Applied Mathematics* curriculum developed by CORD (see South-Western publications). Each of the 37 units provides detailed instruction on one particular area of applied math, allowing users to master each concept before moving on to the next unit. Each unit contains one computerized lesson and quiz, written handout quizzes, teaching materials, and career-specific computerized quizzes, including quizzes for health occupations.

Consortium for Mathematics and Its Applications (COMAP)

TP 000 952-001 017

COMAP's Math Packs each contain six or more lessons that illustrate a particular mathematics topic or application. Of particular relevance for health services students are Math Pack modules such as the following:

- ✓ *Population Growth and the Logistic Curve.* Module 68. Applications of Calculus to Biology
- ✓ *Measuring Cardiac Output.* Module 71. Applications of Calculus to Medicine
- ✓ *Epidemics.* Module 73. Applications of Calculus to Medicine
- ✓ *Tracer Methods in Permeability.* Module 74. Applications of Calculus to Medicine
- ✓ *Human Cough.* Module 211. Applications of Calculus to Physics, Biology, and Medicine
- ✓ *Evaluation of Diagnostic Tests and Decision Analysis.* Module 377. Applications of Probability and Statistics to Medicine
- ✓ *Genetic Counseling.* Module 456. Applications of Probability to Medicine
- ✓ *Statistical Evaluation of Burn Care.* Module 533. Applications of Probability and Statistics to Health Sciences
- ✓ *Concentration of Solutions.* Module 584. Applications of Arithmetic to Allied Health
- ✓ *Examining Data: A General Strategy and One-Sample Methods.* Module 629. Applications of Statistics.

Contemporary Books

✓ ***Math Problem Solver: Reasoning Skills for Application*** TP 000 611
Text emphasizes translating word problems into mathematical language.

✓ ***Math Skills That Work: A Functional Approach for Life and Work*** TP 000 625-626
Book One covers working with whole numbers and money; sorting and filing numerically; writing checks; filling out receipts, purchase orders, and forms; balancing checkbooks; and interpreting paycheck stubs. Book Two covers using decimals, fractions, and percents; reading thermometers, rules, scales, and gauges; interpreting graphs and data; calculating commissions and interest; determining unit prices and extended costs; and understanding budgets and schedules.

✓ ***Number Power Review*** TP 000 613
Text covers from whole numbers to algebra, and prepares students to take—and pass—standard math assessment and competency exams.

Curriculum and Instructional Materials Center—Oklahoma

CIMC's Mathematics series emphasizes applied practice. Each instructional package is specifically oriented toward students pursuing vocational training and is supported by assignment sheets. Titles include the following:

✓ ***Whole Numbers***
✓ ***Fractions***
✓ ***Measurement***
✓ ***Decimals and Percents***
✓ ***Geometry***

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✓ *Applying Medication Math Skills: A Dimensional Analysis Approach*

Topics in this comprehensive book range from basic mathematics to medication dosages based on body weight. The combination of the dimensional analysis problem-solving approach and hands-on learning activities simulate clinical experiences. "Does your answer make sense?" is asked repeatedly to build critical thinking skills, and concepts are reinforced by step-by-step descriptions of the processes.

✓ *Clinical Calculations: A Unified Approach*

Introduces the dimensional analysis method and recommends its use for calculating ***all*** drug dosages in order to help eliminate confusion, reduce errors, and build confidence. Numerous examples and practice problems, actual drug labels, and an interactive CD-ROM are included.

✓ *Dosage Calculations: A Ratio-Proportion Approach*

This book provides an extensive math review, presents concepts—from beginning to advanced—in manageable segments, and includes hundreds of practice problems. Critical thinking scenarios show dosage errors, their consequences, and how to prevent them. Actual drug labels, equipment photos, illustrations, and an interactive CD-ROM are also included to support learning.

TP 000 006

✓ *Fundamental Mathematics for Health Careers, 3rd ed.*

Following a developmental sequence of mathematical topics, this text reviews and teaches math skills and applies them to the solution of practical problems in the health care field. Applications relate to dosages, solutions, microorganisms, laboratory tests and results, normal ranges and levels, and the making of administrative decisions. A glossary of health terms is included, and a final unit has been added to show how spreadsheets can be used to organize, calculate and process data.

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TP 000 007

✓ *Mathematics for Health Occupations*
This text provides up to a full year of mathematics instruction geared specifically to health occupations. The first six chapters review essential basic math skills to provide a foundation for the remaining chapters. The next six chapters teach specific skills needed in health occupations, including measurement (height, weight, volume), metric system, roman numerals (used in prescriptions and physician's orders), medication dosages, vital signs, and intake/output. The last five chapters cover money management and office skills.

✓ *Medications and Mathematics for the Nurse, 8th ed.*
Provides a comprehensive introduction to pharmacology, covering basic mathematics, calculation of dosages, administration of medication, and essential drug information as it relates to classification and/or effects on body systems. Critical thinking questions and activities stress application of the concepts/skills learned.

✓ *Practical Problems in Mathematics for Health Occupations*
Uses word problems as a means of introducing beginning health professionals to the wide variety of problems they can expect to encounter in the field. Covers all math concepts, including whole numbers, fractions, decimals, metrics, graphs, business applications, medications, and measuring instruments. Includes many practical applications and word problems, which progress from the simple to the increasingly more difficult. Includes help in learning to read health-related graphs, charts, and diagrams.

✓ *Respiratory Care Calculations, 2nd ed.*
A step-by-step approach is used to help students complete each of the essential caculations used in the practice of respiratory care. Each equation is accompanied by the abbreviations, followed by an example of its calculation. Pertinent clinical notes are described at the end of each topic. Practice exercises are included to reinforce learning and retention. A review of basic math functions is included.

Glencoe/McGraw-Hill

TP 001 377-382

✓ *Algebra 1: Integration, Applications, Connections*

✓ *Algebra 2: Integration, Applications, Connections*

These full-color texts balance skill and concept development with applications, connections, problem solving, critical thinking, and technology. Content from all mathematical strands—geometry, statistics, probability, data analysis, discrete mathematics, and algebra—are fully integrated in the program. Continual, practical real-life applications and long-term *Investigation* projects keep students actively involved and engaged. *Graphing Technology* lessons make the focus on modeling and functions attractive and accessible to all students. A wide variety of supporting materials and teaching aids are available to support the text, including interactive multimedia applications, manipulatives, full-color masters and transparencies, lab manuals, and assessment/evaluation tools. Scenarios and problems derived from life and the real world of work provide the context for applications throughout.

Houghton Mifflin Company

TP 000 379

✓ *Integrated Mathematics*

The goal of this text is to develop students' abilities to explore and solve mathematical problems, think critically, work cooperatively with others, and communicate ideas clearly. The units included in this (the first of three texts) are exploring and communicating mathematics; using measures and equations; representing data; coordinates and functions; equations for problem solving; ratios, probability, and similarity; direct variation; linear equations as models; reasoning and measurement; and quadratic equations as models.

TP 000 380

✓ *Integrated Mathematics. Teacher's Edition*

The teacher's edition discusses the integrated math program, presents teaching strategies, and provides information on how to use the teacher's edition. The student text with answers and teaching notes is included.

✓ *Mathematical Connections: A Bridge to Algebra and Geometry* TP 000 426

Topics covered in this text include arithmetic to algebra; integers; equations; graphs and data analysis; geometry; number theory and fraction concepts; rational numbers; ratio, proportion, and percent; circles and polygons; statistics and circle graphs; probability; inequalities and graphing on the coordinate plane; surface area and volume; and polynomials.

Mosby

✓ *Laboratory Mathematics: Medical and Biological Applications, 5th ed.*

Designed to help students develop the mathematical skills necessary for competent laboratory work. Provides simplified explanations of the equations, formulas, and calculations used in clinical and biological laboratories, and includes more than 1,000 practice problems as well as extensive appendices.

✓ *Practical Math for Respiratory Care: A Text and Workbook*

Provides a comprehensive explanation and review of essential respiratory care math skills as they apply to clinical situations. Every chapter has learning objectives, clinical significance boxes, sample problems related to each new concept, and practical exercises.

National Council of Teachers of Mathematics (NCTM)

✓ *How to Use Conjecturing and Microcomputers to Teach Geometry* TP 000 644

This guide for teachers tells how to use microcomputer software (e.g., Geometric Supposers) to teach students to behave like working mathematicians who conjecture and prove within a community of learners. The approach is described, questions typically asked by teachers are answered, and an introductory lesson is included.

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✓ *Mathematics Projects Handbook, 4th ed.*
Presents projects that range from simple demonstrations of mathematical problems to complex, sophisticated research projects for entering fairs and competitions. Suggests resources that take advantage of Internet search engines and Websites.

Paradigm Publishing, Inc.

TP 000 685-685

✓ *Math for Workplace Success*
Integrates skill development and mechanics and teaches students to apply basic math skills to solve problems they will encounter in the workplace. (Text and Instructor's Guide)

Partnership for Academic and Career Education (PACE) Consortium

TP 000 198-199

✓ *Applications from Medical Laboratory Technology: A Teacher's Guide. Mathematics for the Workplace*
✓ *Applications from Radiology: A Teacher's Guide. Mathematics for the Workplace*
These units help students relate concepts and theories presented in the classroom to the context of real-life situations: fractions and decimals in the medical lab; ratios and exponents in radiology.

South-Western Educational Publishing

✓ *Algeblocks*
These reproducible lab activities and hands-on, student-friendly manipulatives help students experience and visualize algebraic concepts at a concrete level. Also available in an interactive software version.

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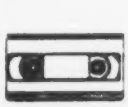
✓ *Algebra 1: An Integrated Approach*

This text uses a thematic approach to teaching algebra, with real-life applications, interdisciplinary connections, and connections within mathematics. The chapters cover data and graphs; variables, expressions, and real numbers; linear equations; functions and graphs; linear inequalities; linear functions and graphs; systems of linear equations; systems of linear inequalities; absolute value and the real number system; quadratic functions and equations; polynomials and exponents; polynomials and factoring; geometry and radical expressions; and rational expressions.

Each chapter is organized around a theme. The theme for the chapter on functions and graphs, for example, is sports. The math concepts are all presented in relation to sports-related problems. Teamwork is encouraged; students are asked to solve problems working in small groups and pairs. After a concept is explained, activities give students the opportunity to apply the concept (practice), extend their understanding, and think critically.

Each chapter ends with a project. For the sports theme, the project is to collect, organize, and analyze school sports data and create a Sports Showcase. An Internet address is provided to help students research each project online. Related careers (and the math involved in them) are highlighted throughout each chapter. The sports careers described are greenskeeper, sports referee, and sports statistician.

The **total package** includes not only the text, but also transparencies, theme posters, topic posters, themes video and videodisc, algeblocks, annotated teacher's edition, software-generated assessment, and a teaching resources box with resource books, math handbooks, technology activities for graphing calculator and computer software, study skills activities, and lesson plans.



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✓ *Algebra 2: An Integrated Approach*

Similar in format to ***Algebra 1*** described above, this text covers modeling and predicting; real numbers, equations, and inequalities; functions and graphs; systems of linear equations; polynomials and factoring; quadratic functions and equations; inequalities and linear programming; exponents and radicals; exponential and logarithmic functions; polynomial functions; rational expressions and equations; conic sections; sequences and series; probability; trigonometric functions; and trigonometric equations and identities.

Samples TP 000 140-143

✓ *Applied Math: Course Materials*

These course materials stress applications in real-world job situations and allow for a broad range of student entry-level capabilities. The six activity sessions for each unit serve as a guide to the sequence of activities. An implementation notebook is also available. The teacher's guide for each unit contains a page-by-page annotation of the text for students, a teaching outline, correlation of unit goals and subunit objectives, supplementary resource lists, information about video segments, detailed lab prep instructions, and related information sources.

TP 001 343-354

✓ *CORD Applied Mathematics: A Contextual Approach to Integrated Mathematics*

These course materials for a two-year program teach pre-algebra, algebra, and geometry within the context of occupational settings and engage students—working in cooperative teams—in lab-centered, hands-on activities that make mathematical concepts practical and relevant. The 40 units in this series—CORD's original mathematics curriculum—are still available but have been joined by three other new ***Mathematics in Context*** texts. Thirty-seven of the units cover math concepts/skills (e.g., estimating answers) and three provide an introduction to using a calculator, including converting fractions to decimals and rounding off.

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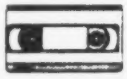
✓ *CORD Bridges to Algebra and Geometry: Mathematics in Context*

This integrated learning **package** teaches the foundations of algebra and geometry using an interactive, workplace-centered approach. Working in cooperative teams, students experience mathematical concepts through completion of hands-on math labs and class activities. The program offers connections and applications to everyday life, emphasizes the use of math in the workplace, and provides ongoing opportunities through lesson development and exercises to improve critical thinking skills.

CORD = Center for Occupational Research and Development

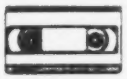
✓ *CORD Algebra 1: Mathematics in Context*

Using an interactive, workplace-centered approach and real-world applications, this text teaches abstract concepts through concrete experiences and integrates topics such as trigonometry, statistics, and probability. Video segments set the stage for each chapter by demonstrating how algebra is used in today's workplace. Hands-on math labs give students, working in cooperative groups, the opportunity to experience mathematical concepts and improve critical thinking skills. The program provides multi-step exercises covering five occupational areas, including health occupations.



✓ *CORD Geometry: Mathematics in Context*

Using an interactive, workplace-centered approach and real-world applications, this text teaches abstract concepts through concrete experiences and integrates geometry with ideas from algebra, probability, statistics, discrete mathematics, and trigonometry. It presents proof in paragraph, two-column, flow chart, indirect, coordinate, and transformational formats. Hands-on math labs give students, working in cooperative groups, the opportunity to experience mathematical concepts and improve critical thinking skills. The program provides multi-step exercises covering five occupational areas, including health occupations. Workplace-related videos support the package.



237

TP 000 925-926

✓ *Math Matters: An Integrated Approach*
Similar in format to *Algebra 1* and *Algebra 2*, this three-book program reinforces the connections between algebra and geometry, while developing problem-solving skills. Working with themes that apply to their everyday lives, students explore new math concepts and generalizations by weaving together number sense, algebra, geometry, statistics, and logic.

✓ *Mathematics of Money with Algebra*
Written in a story format for maximum reader involvement, this text presents interesting characters facing a series of financial dilemmas requiring that financial decisions be made. Use of Algebra 1 skills and use of the graphing calculator and computer spreadsheets are integrated throughout. Special projects—such as buying a home or forming a small business—are provided at the end of each chapter.

✓ *Mathematics: Modeling Our World*
Produced by the Consortium for Mathematics and Its Applications (COMAP), this curriculum for Grades 9-11 uses true modeling to teach mathematics. Students learn and use mathematical tools to explore a broad range of real-world themes. This rigorous program provides hands-on activities, collaborative learning exercises, and authentic assessment materials. Video, software (on CD-ROM), and graphing calculator activities are an integral part of each unit.

✓ *Occupational Mathematics*
This book concentrates on helping students acquire the mathematics tools they need for solving the problems they will encounter in everyday living and in the workplace. Students learn the skills and processes for solving problems by thinking their way through problems through the creation of algorithms before any numbers or calculations are applied. All problems within the book relate directly to occupational or consumer situations.

238

Sunburst Communications

✓ *Data Visualization: Meaningful Math* TP 000 640

Using dozens of examples based on real-world situations, this text helps students learn how to describe data with graphs and statistics, discover the best way to describe a set of data, read what the data are saying, and communicate the information through a picture.

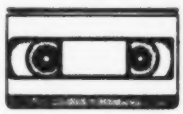
239

Applied Science

Agency for Instructional Technology (AIT)

✓ *Inside Our Human Body*
The eight 15-minute programs in this video series present the human body from the mechanics of a single heartbeat to the potential of genetic engineering, going beyond the basics by documenting human mechanics in motion. Individual programs cover the ear, heart, kidneys, muscles, skeleton, skin, smell and taste, and genetics.

Cambridge Educational



This publisher offers an extensive collection of videos and CDs related to health and the human body. The following is just a small sampling of the titles in this collection. The full catalog can be reviewed online or ordered in print version from the publisher.

✓ *The New Living Body*
This ten-part video series provides a comprehensive answer to two questions: How does the human body work? What advances have been made in medicine over the past 15 years that enable us to understand the human body better? Each 20-minute program contains three major elements: (1) live-action video showing the human body in action, often under experimental conditions, to put the theme of each program into context; (2) the most up-to-date imaging technology—including X rays, radioisotope and ultrasound scans, fiber optics, MRIs, and video of surgery—to provide unparalleled glimpses into the inner working of the body; (3) three-dimensional computer graphics to provide easy-to-understand illustrations of processes and functions that are otherwise difficult to see. (Video)

✓ *Cellular Respiration*
This series examines the essential fuels and machinery used by living forms to sustain themselves. The fuel glucose is then broken down through the processes of glycolysis, the Krebs cycle, and oxidative phosphorylation. (Video)

✓ *Metabolism and Nutrition*
Looks at the role of ATP in biological systems. (Video)

✓ *Circulatory System*
Explores the circulatory system's important role in transportation, purification, and regulation. (Video)

✓ *Brain and Nervous System*
Uses the analogy of computers and the Internet to explore the brain and nervous system. (Video)

✓ *Respiratory System*
Uses the analogy of an automobile's fuel intake/exhaust system to explore the makeup and functions of the respiratory system. (Video)

✓ *Contemporary Nutrition*
Highlights foods from the major food groups and their relationship to the Dietary Guidelines for Americans. (CD-ROM)

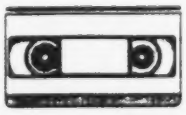
✓ *Cholesterol Explained*
Begins with an introduction to the Framingham study of heart disease factors. (Video)

✓ *Lung Cancer*
Looks at how cigarette smoking and second-hand smoke cause irritation of the cells of the lung, which leads to cancerous growth, and at new drug therapies. (Video)

✓ *The Silent Hunger*
Examines the causes, symptoms, and effects of, and treatments for, anorexia nervosa, bulimia nervosa, and binge eating syndrome. (Video)

Coastal Video Communications Corp.

TP 000 750-751



✓ *Office Ergonomics*
✓ *Ergonomics: Your Body at Work*
These 15- to 20-minute videos show how ergonomics (human engineering) can minimize job stress and prevent Cumulative Trauma Disorder.

✓ *General Office Safety: Working Smart*

TP 000 752-753

This 20-minute video (supported by a handbook) shows how to avoid slips, trips, and falls in the workplace.

Curriculum and Instructional Materials Center

✓ *Body Structure and Function*

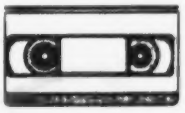
TP 000 089-090

This teacher's guide and student book cover the following topics: basic concepts of physical science, basic concepts of life science, microbiology and bacteriology, integumentary system, skeletal system, muscular system, digestive system, blood, heart, circulatory system, respiratory system, peripheral nervous system, special senses, endocrine system, and reproductive system.

GPN Educational Media

✓ *Introducing Biology: Digestion*

TP 000 892



This 30-minute video on digestion includes hands-on investigations, collaborative activities, three levels of exercises to provide increasingly challenging practice and problem solving, and real-world problems.

Jones and Bartlett Publishers

✓ ***Human Biology: Health, Homeostasis, and the Environment, 3rd ed.***

Puts human biology in a modern context by showing that our health depends on well-functioning organ systems, which are, in turn, dependent on a healthy social, psychological, and physical environment. A critical-thinking focus teaches students how to make informed health decisions and how to think critically about the biological information they encounter in the media. This edition is linked to a comprehensive interactive Website—developed by the publisher and the author—that allows students to test and expand their knowledge. An *Instructors' ToolKit* on CD-ROM provides full-color art files from the text, PowerPoint lecture outline slides, a computerized test bank, and the complete instructor's manual.

Kendall/Hunt Publishing Company

✓ *Basic Genetics, 3rd ed.*

This text stresses our uniqueness—that we are products of the interaction of our genes and our environment. Current activities, articles, stories, editorials, letters, and interviews are presented in a high-interest magazine format.

✓ *Biotechnology*

Helps students become aware that there are natural processes in life and that these processes can be altered and/or accelerated. Students are challenged through hands-on activities and analysis.

✓ *Bottle Biology*

Model a rain forest. Explore an ecosystem. Create a spider habitat. Bottle Biology is an "idea" book, presenting ways to use plastic bottles and other recyclable material to teach about science and the environment.

✓ *BSCS Biology: A Human Approach*

This program organizes content around unifying biological principles, and teaches through hands-on activities and inquiry. A unique essay section, included in the textbook itself, provides an expanded view of biology content, history, culture, and the nature of science. Students use the essays—substantive, relevant discussions of complex biological concepts—as resources when completing activities. The program also provides journal and portfolio activities, a complete authentic assessment package, laboratory investigations, written assessments, cooperative learning, formative assessment, and discussions.

TP 000 106

✓ *ChemCom—Chemistry and Community: A Solution with Substance*

Produced by the American Chemical Society, this text uses intriguing activities to make students aware of chemistry-related issues in their community and their potential contributions to those issues. Students learn and use chemical facts and concepts as needed to understand the societal issues being addressed, and their interest in chemistry grows as they discover its real-world applications. A videodisc package is also available.

✓ *Chemistry & Cell Biology for Allied Health Science*

✓ *General Chemistry Experiments for the Allied Health: A Prescription for Common Lab Ailments*

✓ *Human Body Explorations*

Developed at the Exploratorium, world-renowned hands-on science museum, this teacher resource book is filled with high-interest activities that use no-cost or low-cost materials. Students investigate the human body at macroscopic and microscopic levels, gain experience with sound scientific methods, and have ample opportunity to pursue their own questions.

✓ *Insights in Biology*

A comprehensive introduction to biology that uses class time primarily for activities and discussion so that learning is student-driven. The program is inquiry-based and activity-oriented and addresses current advances in biology and technology. Concepts are developed in relevant contexts. The five modules in the program are *The Matter of Life, The Blueprints of Infection, Different States Through the Ages, Traits and Fates,* and *What on Earth?*

✓ *Microbiology: Laboratory Manual for Allied Health and General Microbiology*

✓ *Microscale Chemistry for High School*

The collection of microscale activities in this fun-filled supplemental text is designed to be easily adapted to any high school chemistry course.

✓ *Minds on Physics*

Uses a constructivist, activity-based, student-centered approach. Students learn to analyze physical situations conceptually, thereby improving both their understanding and their problem-solving ability. There are no traditional labs. Students work together, using simple equipment to learn about fundamental physical concepts and principles and how to apply them properly. The program comprises the following six texts: *Motion, Interactions, Conservation Laws and Concept-based Problem Solving, Fundamental Forces and Fields, Advanced Topics in Mechanics,* and *Complex Systems.*

✓ *Physics from the Junk Drawer & Counter Top Chemistry*

✓ *Prime Science*

This science program coordinates all major areas of science: biology, chemistry, earth and space science, and physics. It is activity-led and context-based, building upon the interests students bring with them from everyday experiences. Underlying scientific concepts are introduced as needed for understanding the topic being studied.

✓ *The Real World of Chemistry*

A source for practical chemistry activities and applications that will allow students to see for themselves what an important role chemistry plays in their everyday lives. Can be used as a student workbook or a teacher resource guide.

✓ *Science Experiments and Projects for Students*

This interactive book requires students to take action—to inquire, discover, and answer questions. With practice, students learn how to design experiments, collect data, analyze statistics, do library research, and write effectively about and present experimental findings.

Mosby

✓ *Anatomy & Physiology with Student Survival Guide, 4th ed.*

This introductory text presents a large, complex body of scientific knowledge in an easily understood conversational writing style, focusing on concepts rather than just descriptions to help students unify information. By using "big picture" and "cycle of life" themes throughout, the text helps students learn the interrelation of body systems and the body's change in relation to age and development. Includes an interactive CD-ROM.

✓ *Applied Pharmacology for the Dental Hygienist, 4th ed.*

Provides up-to-date, accurate information on some of the most important pharmacological topics for dental hygiene students, including antineoplastic drugs, respiratory and gastrointestinal drugs, hormones, and drugs used to treat common oral entities. Numerous tables and colorful graphics are included.

✓ *Essentials of Ultrasound Physics*

This concise, practical, easy-to-follow text covers broadband transducers, modern beam formers, dynamic frequency filtering, intraluminal transducers, color flow imaging methodology, bioeffects and acoustic output labeling standards.

✓ *Fundamentals of Anatomy & Movement: A Workbook and Guide*

Designed to expand knowledge and test critical thinking skills, this text provides important coverage of terminology, bones, joints, and muscular structure, and then delves into the heart of the book: the mobility of the human body. Stimulating lab exercises, activities, vocabulary lists, and numerous tables and figures support the content.

✓ *Pharmacology in Nursing, 20th ed.*

Provides thorough coverage of more than 1,000 generic and trade drugs, including more than 200 new drugs recently approved by the FDA. Two new chapters are presented on over-the-counter medications and alternative medications. Other new features include boxes on the management of drug overdoses and highlighted content on serious drug interactions. This book features critical thinking questions, case studies, and new collaborative activities at the end of each chapter.

✓ *Radiation Therapy Physics, Simulation, and Treatment Planning*

Early chapters explain applied math and radiation physics in preparation for the chapters on simulation and dosimetry that follow. The most up-to-date technologies and applications, including the latest in virtual simulations, are discussed throughout the book.

Multistate Academic and Vocational Curriculum Consortium (MAVCC)

TP 000 060

✓ *Anatomy and Physiology, 2nd. ed.*

Introduces students in health occupations programs to the organization of the human body, its structures, and its functions. Cells, tissues, and membranes are discussed, followed by units on the various organ systems, including skeletal, muscular, nervous, digestive, circulatory, respiratory, reproductive, urinary, endocrine, and immune.

South-Western Educational Publishing

✓ *Biology: A Community Context*

An inquiry-based learning approach is used to help students visualize, explore, and find new ways of thinking and acting in response to their learning. The eight units address a wide range of student interest, and each takes students from awareness and concern about science issues in their community and moves them to action. Each unit starts with a short video, following which students set up and conduct investigations, reading about what they are observing, and writing about their understandings and deeper questions still to be discovered. Students monitor their progress using self-assessment tools, share what they learn with other students, further explore areas of interest or concern, vote on community action, and use role-plays to enact scenarios that demand a decision and plan of action for dealing with a specific biological issue related to the unit.

TP 000 829-852, 882

✓ *CORD Applications in Biology/Chemistry: A Contextual Approach to Laboratory Science, 2nd ed.*

The ABC materials consist of 12 units: natural resources, water, air and other gases, continuity of life, nutrition, disease and wellness, plant growth and reproduction, animal life processes, microorganisms, synthetic materials, waste and waste management, and community of life.

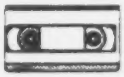
✓ *CORD Biology: Science in Context*

Through contextual instruction, this general biology course puts biology topics in perspective by relating them to work, careers in science, or personal experiences. Each chapter includes information about careers that require the skills being learned and hands-on activities and laboratory investigations that require application of those skills. Content is divided into five units: continuity and diversity of life, microorganisms, animals, plants, and communities and environment. Coordinated text, lab, and video materials address the diversity of learning styles in today's classroom.

✓ *CORD Principles of Technology*

Samples TP 000 151-153

The PT materials allow students to discover and experience traditional physics concepts in the context of their relationship to four energy systems: mechanical, fluid, electrical, and thermal. Students apply problem-solving and mathematical skills and physics concepts to workplace situations. The materials include student and teacher text materials, workplace-related video programs, mathematical skill labs, and over 90 hands-on laboratory activities.

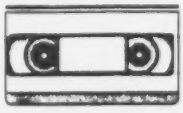


Sunburst Communications

✓ *The World of Chemistry Videos*

TP 000 646-655

These video and print materials—designed by high school teachers with the help of their students—provide demonstrations, experiments, and suggestions for research projects within an integrated curriculum. Each videotape is 30 minutes long, contains two programs, and is accompanied by a teacher's guide. Videos cover color/measurement; states of matter/the mole; the atom/the periodic table; chemical bonds/organic chemistry; molecular fingerprints/water; the atmosphere/the driving forces; chemical kinetics/catalysts; acids and bases/chemistry of the earth; oxidation and reduction/metals; and polymers/biochemistry.



Contact Information

Agency for Instructional Technology (AIT)
Phone: 800-457-4509
Fax: 812-333-4218
E-mail: <info@ait.net>
Website: <http://www.ait.net>

American Management Association (AMACOM)
Phone: 800-262-9699
Fax: 212-903-8168
Website: <http://www.amanet.org>

Aspen Publishers, Inc.
Phone: 800-234-1660
Fax: 800-901-9075
E-mail: <customer.service@aspenpubl.com>
Website: <http://aspenpub.com>

Association for Career and Technical Education (ACTE)
(Formerly the American Vocational Association)
Phone: 800-826-9972
Fax: 703-683-7424
E-mail: <acte@acteonline.org>
Website: <http://www.acteonline.org>

Butterworth-Heinemann
Phone: 800-366-2665
Fax: 800-446-6520
Website: <http://www.bh.com>

Cambridge Educational
Phone: 888-744-0100
Website: <http://www.cambridgeol.com>

Career Communications, Inc.
Phone: 800-669-7795
Fax: 913-362-4864
E-mail: <ccinfo@carcom.com>
Website: <http://www.carcom.com>

Note that many of the texts mentioned in this section are available through the major online bookstores. If you have Internet access and are comfortable ordering online, this is an easy, quick, and economical way to secure books from many different publishers from one source. Examples of online bookstores include—

<http://www.amazon.com>
<http://www.barnesandnoble.com>
<http://bookstore.mcgraw-hill.com>
<http://www.alldirect.com>

CareerTrack Publications
Phone: 800-488-0928
Fax: 918-665-3434
Website: <http://www.careertrack.com>

Coastal Video Communications Corp.
Phone: 800-285-9107

Communication Briefings
Phone: 800-888-2086
Fax: 609-232-8245

Consortium for Mathematics and Its Applications (COMAP)
Phone: 800-772-6627
Fax: 781-863-1202
E-mail: <info@comap.com>
Website: <http://www.comap.com>

Contemporary Books
Phone: 800-621-1918
Fax: 800-998-3103
E-mail: <cbooks@tribune.com>
Website: <http://www.contemporarybooks.com>

Curriculum and Instructional Materials Center
Oklahoma Department of Vocational and Technical Education
Phone: 800-654-4502
Fax: 405-743-5154
Website: <http://www.okvotech.org/cimc>

Curriculum Publications Clearinghouse
Western Illinois University
Phone: 800-322-3905
Fax: 309-298-2869
E-mail: <CPC@wiu.edu>
Website: <http://www.wiu.edu/users/micpc/index.html>

Delmar Publishers
Phone: 800-998-7498
E-mail: <info@delmar.com>
Website: <http://www.delmar.com>

EDINFO Press
ERIC Clearinghouse for Reading, English, and Communication
Phone: 800-759-4723
Fax: 812-856-5512
Website: <http://www.indiana.edu/~eric_rec>

Glencoe/McGraw-Hill
Phone: 800-334-7344
Fax: 614-755-5682
Website: <http://www.glencoe.com>

GPN Educational Media
Phone: 800-228-4630
Fax: 402-472-1785

Great Source
Houghton Mifflin
Phone: 800-289-4490
Website: <http://www.greatsource.com>

Houghton Mifflin Company
Website: <http://www.hmco.com>

Jones and Bartlett Publishers
Phone: 978-443-5000
Fax: 978-443-8000
E-mail: <info@jbpub.com>
Website: <http://www.jbpub.com>

Kendall/Hunt Publishing Company
Phone: 800-228-0810
Website: <http://www.kendallhunt.com>

Mosby
Phone: 800-426-4545
Fax: 800-535-9935
E-mail: <customer.support@mosby.com>
Website: <http://www.mosby.com>

Multistate Academic and Vocational Curriculum Consortium (MAVCC)
Phone: 800-654-3988
E-mail: <mavccweb@okvotech.org>
Website: <http://www.mavcc.org>

National Council of Teachers of Mathematics (NCTM)
Phone: 703-620-9840
Fax: 703-476-2970
E-mail: <infocentral@nctm.org>
Website: <http://www.nctm.org>

Ohio Agricultural Education Curriculum Materials Service
Phone: 614-292-4848
Fax: 800-292-4919
E-mail: <cms@osu.edu>
Website: <http://www-cms.ag.ohio-state.edu>

Paradigm Publishing, Inc.
Phone: 800-535-6865
Fax: 612-771-5629

Partnership for Academic and Career Education (PACE) Consortium
Phone: 864-646-8361
Fax: 864-646-8256
Website: <http://www.scteched.tec.sc.us/TCTC/PACE>

South-Western Educational Publishing
Phone: 800-354-9706
Fax: 800-487-8488
Website: <http://www.swep.com>
Math Discussion List:
Send message to <majordomo@list.thomson.com>
Type only <subscribe south-western-math: *your_email_address*>

Sunburst Communications
Phone: 800-431-1934
E-mail: <service@nysunburst.com>
Website: <http://www.sunburst.com>

Virginia Vocational Curriculum and Resource Center
Phone: 804-673-3778
Fax: 804-673-3798
E-mail: <vvcrc@vvcrc.tec.va.us>
Website: <http://vvcrc.tec.va.us>

BEST COPY AVAILABLE

Insert the
"Sample OCAP"
Tab Here

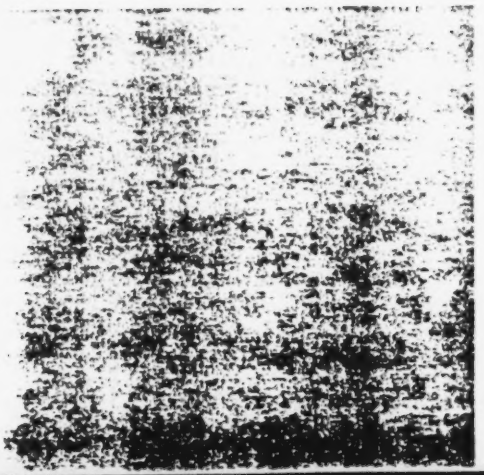
Sample OCAP

The following pages are ***excerpts*** from the 1997 Occupational Competency Analysis Profile (OCAP) for *Diversified Health Occupations*. They are included to show that academic skills are an inherent part of any occupational profile—which is why the OCAP (or ITAC) document is a good source of information for academic teachers seeking to identify occupational contexts for their instruction. Pages from three sections of the OCAP are provided.

In the excerpts from the first section (OCAP pages 4-5, 8-9, 16-17, 23-24, 29-31), the selected units, competencies, and competency builders for the occupational area include many academic skills. For example, science is a part of Competency 1.5 (anatomy and physiology), Competencies 3.4–3.8 (dealing with bacteria and infectious waste), Competency 3.10 (body mechanics and ergonomics), and Unit 8 (laboratory procedures). Mathematics skills are required in Competencies 6.2–6.5 (measuring vital signs) and in Competency 12.4 (maintaining client accounts). Communication skills are a focus in Units 12 and 13 (Office Procedures and Communications), as well as being threaded throughout the profile; for example, reading (Builder 1.1.6); interpreting nonverbal communication (Builder 5.17.8); questioning (Builder 6.7.1); giving oral instructions (Builder 8.2.8); and reporting (Builder 8.5.4).

The ***level*** of applied academic skills that—according to business and industry—students must master to qualify for and be successful in their occupation of choice is shown in the excerpt from the second section (OCAP pages 47-48). This Job Profiling process was developed by American College Testing (ACT) as part of its Work Keys assessments, which cover the following academic skills: locating information, reading for information, applied mathematics, applied technology, listening, writing, and teamwork.

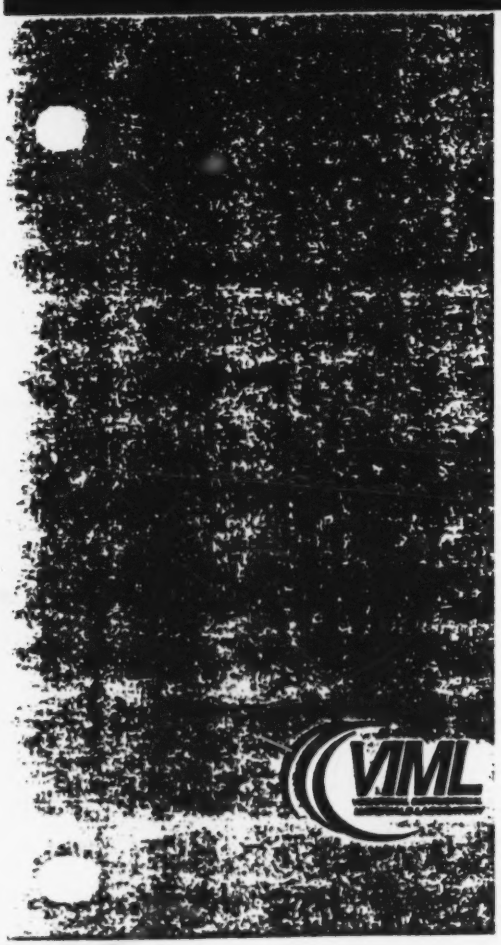
The excerpts from the third section (OCAP pages 73 and 76-79) identify which academic competencies from the state standards (those in effect in 1996) were selected by business and industry representatives as most crucial for entry-level employees in the occupational area.



OCAP

OCCUPATIONAL COMPETENCY ANALYSIS PROFILE

DIVERSIFIED HEALTH OCCUPATIONS



VERIFICATION PANEL

The Diversified Health Occupations OCAP is a compilation of selected competencies from three existing OCAPs: Nurse Aide, Medical Assistant, and Dental Assistant. For each of these areas, a panel representing business, industry, labor, and community-based organizations was convened to verify the occupational competencies required for entry-level employment. Lists of the members of each panel are provided at the end of this document.

Division of Vocational and Adult Education
Ohio Department of Education

BEYOND 2000

Vocational Instructional Materials Laboratory
Center on Education and Training for Employment

Introduction

What is an OCAP?

According to the *Action Plan for Accelerating the Modernization of Vocational Education: Ohio's Future at Work*—

> A comprehensive and verified employer competency list will be developed and kept current for each program
>
> —Imperative 3, Objective 2—

The Occupational Competency Analysis Profiles (OCAPs) are the Ohio Division of Vocational and Adult Education's response to that objective.

OCAPs are competency lists—verified by expert workers—that evolve from a modified DACUM job analysis process involving business, industry, labor, and community agency representatives from throughout Ohio. The OCAP process is directed by the Vocational Instructional Materials Laboratory located at The Ohio State University's Center on Education and Training for Employment.

How is the OCAP used?

Each OCAP identifies the occupational, academic, and employability skills (or competencies) needed to enter a given occupation or occupational area. The OCAP not only lists the *competencies* but also clusters those competencies into broader *units* and details the knowledge, skills, and attitudes (*competency builders*) needed to perform each competency.

Within the competency list are two levels of items: core and advancing. *Core items*, which are essential for entry-level employment, are required to be taught and are the basis for questions on the Ohio Vocational Competency Assessment (OVCA). *Advancing items* (marked with an asterisk) are those needed to advance in a given occupation.

The content of the Diversified Health Occupations (DHO) OCAP document derives from the revised (1995) OCAPs for Nurse Aide, Medical Assistant, and Dental Assistant (the "parent" OCAPs). The following process was used to select the content to be included:

- ✓ The total Nurse Aide OCAP was included as the core of the DHO OCAP.
- ✓ Competencies to be included from the Medical Assistant and Dental Assistant OCAPs were selected through surveys sent to Ohio DHO instructors. Respondents rated each competency according to its importance to the DHO curriculum using a Likert-type scale. Average ratings were used to categorize instructors' responses into three levels: high, medium, and low. Those competencies receiving "high" ratings were added to the Nurse Aide core; and the compiled units, competencies, and competency builders were reordered slightly according to instructional logic.

Unit 1: Orientation

Competency 1.1: Demonstrate familiarity with the medical/dental facility

Competency Builders:

1.1.1 Describe the physical layout of given facility
1.1.2 Identify the location of fire exits and escape routes
1.1.3 Demonstrate the use of fire extinguishers
1.1.4 Demonstrate the use of personal safety apparatus
1.1.5 Identify specialized facility equipment
1.1.6 Access needed information using manufacturer's instructions/manuals

Competency 1.2: Follow facility policies

Competency Builders:

1.2.1 Comply with dress codes
1.2.2 Demonstrate grooming habits appropriate to given facility
1.2.3 Comply with facility policy and procedure manuals and/or handbooks
1.2.4 Comply with facility expectations for specific job assignments

Competency 1.3: Identify facility disaster plan

Competency Builders:

1.3.1 Identify actions to take in the event of fire
1.3.2 Identify actions to take in the event of natural disasters
1.3.3 Identify facility security policies
1.3.4 Identify actions to take in emergency situations other than fire or natural disaster

Competency 1.4: Identify the roles and responsibilities of the health team

Competency Builders:

1.4.1 Differentiate between acute care, long-term care, and home care
1.4.2 Identify the major responsibilities of a nurse aide, medical assistant, or dental assistant
1.4.3 Identify major nursing staff responsibilities
1.4.4 Identify the roles and responsibilities of the governing body (e.g., the owner, administrator, director of nursing, medical director, and other persons of authority)
1.4.5 Identify the roles and responsibilities of regulatory and survey agency personnel
1.4.6 Identify the roles and responsibilities of health care personnel (e.g., client's private physician, volunteers, social services personnel, physical therapist, occupational therapist, and support staff)

Competency 1.5: Demonstrate knowledge of the basic anatomy and physiology of body systems

Competency Builders:

1.5.1 Identify the basic anatomy and physiology of the integumentary system
1.5.2 Identify the basic anatomy and physiology of the nervous system
1.5.3 Identify the basic anatomy and physiology of the senses (i.e., sight, hearing, smell, touch, taste)

Continued

Competency 1.5: Demonstrate knowledge of the basic anatomy and physiology of body systems—Continued

1.5.4 Identify the basic anatomy and physiology of the cardiovascular system
1.5.5 Identify the basic anatomy and physiology of the respiratory system
1.5.6 Identify the basic anatomy and physiology of the musculoskeletal system
1.5.7 Identify the basic anatomy and physiology of the gastrointestinal system
1.5.8 Identify the basic anatomy and physiology of the urinary system
1.5.9 Identify the basic anatomy and physiology of the endocrine system
1.5.10 Identify the basic anatomy and physiology of the reproductive system
1.5.11 Identify the basic anatomy and physiology of the immune system

Competency 1.6: Identify state and federal nurse aide requirements

Competency Builders:

1.6.1 Define standard terms and abbreviations associated with the governmental regulation of nurse aides
1.6.2 Describe the purpose and procedures of nurse aide training
1.6.3 Describe the purpose and procedures of nurse aide competency evaluation
1.6.4 Identify the procedures for being tested and recorded/maintained on the nurse aide registry
1.6.5 Identify the process for reporting and recording the abuse, mistreatment, and/or neglect of a client by a nurse aide

Competency 1.7: Identify the spiritual and cultural aspects of client care

Competency Builders:

1.7.1 Identify the aide's/assistant's role in the spiritual aspects of client care
1.7.2 Identify the role of cultural diversity in client care and its importance to the aide/assistant
1.7.3 Identify resources and support persons that can assist clients in coping with their feelings
1.7.4 Identify resources and support persons that can assist aides/assistants in coping with their feelings

Competency 1.8: Describe the client care planning process

Competency Builders:

1.8.1 Identify the purpose of the client's comprehensive assessment
1.8.2 Identify the purpose of the client's care plan
1.8.3 Identify the purpose of the client's care conference
1.8.4 Identify the nurse aide's role in the care planning process and care conference
1.8.5 Identify the nurse aide's role in gathering and documenting information on a worksheet

Competency 1.9: Demonstrate knowledge of acute care hospitals

Competency Builders:

1.9.1 Identify the purposes of acute care hospitals
1.9.2 Differentiate between general (e.g., primary, secondary, tertiary care) hospitals and specialty hospitals
1.9.3 Differentiate between the skills needed by an aide/assistant for long-term care and for acute care
1.9.4 Identify the skills needed to work as an aide/assistant in acute care

Competency 3.4: Demonstrate sterile techniques*

Competency Builders:

3.4.1 Apply sterile gloves*
3.4.2 Set up sterile tray*
3.4.3 Practice the principles of sterile techniques*
3.4.4 Identify contamination of sterile objects*

Competency 3.5: Practice universal precautions

Competency Builders:

3.5.1 Define terminology associated with universal precautions
3.5.2 Identify universal precautions for dealing with blood and body fluids
3.5.3 Employ established hand-washing technique
3.5.4 Practice personal hygiene
3.5.5 Acquire immunization against communicable diseases
3.5.6 Wear personal protective equipment
3.5.7 Dispose of waste and soiled linen in accordance with facility policy
3.5.8 Identify waste considered infectious
3.5.9 Dispose of infectious waste
3.5.10 Identify waste considered hazardous
3.5.11 Dispose of hazardous waste
3.5.12 Perform terminal disinfection of a unit

Competency 3.6: Practice isolation techniques

Competency Builders:

3.6.1 Identify different types of isolation techniques used in given facility
3.6.2 Identify the purposes of various isolation techniques
3.6.3 Employ strict isolation techniques
3.6.4 Employ respiratory isolation technique

Competency 3.7: Maintain infection control of the dental work area

Competency Builders:

3.7.1 Open/close operatory
3.7.2 Contain soiled protective clothing and towels
3.7.3 Clean/disinfect sink and counter surfaces
3.7.4 Check condition of floors
3.7.5 Clean spills and dropped items from floors

Competency 3.8: Maintain equipment and instruments in clean/sterile condition

Competency Builders:

3.8.1 Identify different sterilization methods
3.8.2 Follow manufacturer's instructions for sterilizing and maintaining equipment
3.8.3 Follow manufacturer's instructions for use of disinfection products
3.8.4 Disinfect dental chair and unit (e.g., overhead light, sink, instrument tray)
3.8.5 Flush waterlines

Continued

Competency 3.8: ***Maintain equipment and instruments in clean/sterile condition—Continued***

3.8.6 Disinfect evacuation system
3.8.7 Disinfect exam table and contact surfaces
3.8.8 Maintain infection control in cabinets and drawers
3.8.9 Predisinfect instruments
3.8.10 Sterilize instruments using a chemical disinfectant solution
3.8.11 Sterilize instruments using an autoclave
3.8.12 Sterilize instruments using a dry heat oven
3.8.13 Maintain sterilization equipment
3.8.14 Store sterilized equipment and supplies
3.8.15 Maintain quality-control log

Competency 3.9: Apply client safety principles

Competency Builders:

3.9.1 Identify ways of maintaining the environment and care so as to minimize the need for physical or chemical restraints
3.9.2 Identify the possible emotional implications of using restraints on elderly clients
3.9.3 Identify the safety rules pertaining to client's activities of daily living (ADL)
3.9.4 Identify when use of heel and elbow protectors is indicated
3.9.5 Identify when use of a bed cradle is indicated
3.9.6 Identify when use of siderails is indicated
3.9.7 Identify the rationale for each protective device
3.9.8 Identify various types of chemical, physical, and environmental restraints
3.9.9 Identify instances in which use of restraints is indicated
3.9.10 Provide examples of the unnecessary use of physical and chemical restraints
3.9.11 Employ accepted methods of applying physical restraints
3.9.12 Identify observations that must be conducted when a client is in restraints
3.9.13 Identify how long restraints may be applied, how frequently they are to be checked, and how long they are to be released

Competency 3.10: Demonstrate the principles of body mechanics and ergonomics

Competency Builders:

3.10.1 Identify the principles of ergonomics and body mechanics
3.10.2 Identify the purpose of ergonomics and body mechanics
3.10.3 Apply the principles of body mechanics in lifting, moving, transferring, ambulating, and positioning clients
3.10.4 Identify common causes of back injuries

Competency 3.11: Apply knowledge of acquired immune deficiency syndrome (AIDS)

Competency Builders:

3.11.1 Differentiate between fact and fallacy concerning the transmission and treatment of immune deficiency diseases
3.11.2 Identify behaviors that promote the spread of AIDS
3.11.3 Identify the legal aspects of AIDS
3.11.4 Provide emotional support to clients with AIDS and their significant others

Competency 5.17: Assist with ambulation

Competency Builders:

5.17.1 Identify situations in which clients may need assistance in ambulating
5.17.2 Ensure maximum independence for clients who need help in ambulating
5.17.3 Identify standard assistive devices and adaptive equipment and their uses
5.17.4 Assist clients in using assistive devices and adaptive equipment
5.17.5 Help clients move from a sitting or supine position to a standing position
5.17.6 Assist clients in ambulating with a cane, walker, or crutches
5.17.7 Help clients with balance in sitting, walking, and standing
5.17.8 Identify signs of distress related to ambulation
5.17.9 Contribute to the development and implementation of ambulation care plans

Unit 6: Medical Database

Competency 6.1: Assist with admissions, transfers, and discharges

Competency Builders:

6.1.1 Display sensitivity to client feelings during admission, transfer, and/or discharge
6.1.2 Assist clients during admission in accordance with facility policy
6.1.3 Assist with assessment procedures as directed by nurse
6.1.4 Assist clients during transfer in accordance with facility policy
6.1.5 Assist clients during discharge in accordance with facility policy

Competency 6.2: Measure/record temperature

Competency Builders:

6.2.1 Identify normal range and average temperature of oral, axillary, and rectal methods
6.2.2 Identify normal causes of variation of body temperatures
6.2.3 Select route for measuring temperature
6.2.4 Demonstrate the procedures for using different types of thermometers
6.2.5 Measure temperature using the oral method
6.2.6 Measure temperature using the axillary method
6.2.7 Measure temperature using the rectal method
6.2.8 Measure tympanic temperature
6.2.9 Record/report temperature measurements
6.2.10 Clean/store thermometer

Competency 6.3: Measure/record pulse

Competency Builders:

6.3.1 Identify the most common and most accurate pulse sites
6.3.2 Identify criteria for selecting pulse site
6.3.3 Identify normal pulse range for different age groups
6.3.4 Measure rate, rhythm, and volume of pulse
6.3.5 Identify factors that may affect pulse rate
6.3.6 Identify variations from normal pulse that should be reported
6.3.7 Record/report pulse measurements

Competency 6.4: Measure/record respiration

Competency Builders:

6.4.1 Identify normal respiratory rate for different age groups
6.4.2 Measure rate, depth, and rhythm of respiration
6.4.3 Identify factors that may affect respiration
6.4.4 Report signs of compromised respiration
6.4.5 Record/report respiration measurements

Competency 6.5: Measure/record blood pressure

Competency Builders:

6.5.1 Follow facility policy regarding aide's/assistant's role in the measuring and recording of blood pressure
6.5.2 Identify normal range of blood pressure for different age groups
6.5.3 Identify equipment used for taking blood pressure
6.5.4 Identify various cuff sizes and their effect on accurate blood pressure reading
6.5.5 Measure blood pressure using a stethoscope and sphygmomanometer
6.5.6 Identify factors that affect blood pressure
6.5.7 Identify variations from normal blood pressure that should be reported
6.5.8 Record/report blood pressure measurements

Competency 6.6: Document activities of daily living (ADL)

Competency Builders:

6.6.1 Identify major categories of activity in ADL
6.6.2 Identify the purpose of promoting client independence in ADL
6.6.3 Identify strategies for encouraging maximum client independence in ADL
6.6.4 Observe ADL
6.6.5 Record ADL in accordance with facility policy
6.6.6 Report ADL in accordance with facility policy

Competency 6.7: Document client orientation to person, place, and time

Competency Builders:

6.7.1 Ask questions to elicit client's orientation to person, place, and time
6.7.2 Identify circumstances that can cause changes in orientation
6.7.3 Report changes in client's orientation to person, place, or time
6.7.4 Identify ways to help reorient clients to person, place, and time

Competency 6.8: Measure/record height, weight, vision, and hearing

Competency Builders:

6.8.1 Identify the medical implications of height and weight
6.8.2 Identify procedures for ensuring accurate weight measurements
6.8.3 Read whole numbers and fractions on scales
6.8.4 Measure client's weight using appropriate type of scale
6.8.5 Report abnormal weight loss or gain

Continued

Competency 7.21: Assist with postmortem care

Competency Builders:

7.21.1 Identify client status as "code" or "no code"
7.21.2 Identify religious and cultural rites and facility policies associated with postmortem care
7.21.3 Demonstrate respect and gentleness in caring for the deceased
7.21.4 Comply with established procedures for the discreet removal of the deceased

Competency 7.22: Provide dental evacuation and retraction in compliance with OSHA, EPA and ODPA

Competency Builders:

7.22.1 Practice universal precautions
7.22.2 Interact with client
7.22.3 Provide for client safety and comfort during dental assisting procedures
7.22.4 Follow established procedures for placement, operation, and control of high-volume/low-volume evacuator
7.22.5 Retract tissue
7.22.6 Follow established procedures for operation of air-water syringe
7.22.7 Perform equipment maintenance and disinfection

Unit 8: Laboratory-Related Procedures

Competency 8.1: Collect sputum specimens*

Competency Builders:

8.1.1 Describe sputum characteristics*
8.1.2 Distinguish between sputum and saliva*
8.1.3 Complete laboratory request forms for sputum testing as directed*
8.1.4 Prepare clients for sputum collection*
8.1.5 Follow established procedures in collecting and disposing of sputum*

Competency 8.2: Collect urine for testing

Competency Builders:

8.2.1 Identify the reasons for routine urinalysis
8.2.2 Identify the reasons for urine collection
8.2.3 Identify commercial products for testing urine
8.2.4 Identify factors that can cause false positive or negative indications
8.2.5 Identify the purpose of obtaining clean-catch urine specimens
8.2.6 Identify instructions for male and female clients when a clean-catch urine specimen is required
8.2.7 Fill out labels and laboratory slips as directed
8.2.8 Instruct clients on the procedure for collecting urine specimens
8.2.9 Assist clients as requested
8.2.10 Complete collection and disposition procedures
8.2.11 Chart/report test results

Competency 8.3: Collect timed urine specimens

Competency Builders:

8.3.1 Identify the most common timed urine specimen tests
8.3.2 Identify instructions for timed specimens
8.3.3 Collect necessary supplies
8.3.4 Collect specimens as directed
8.3.5 Fill out laboratory request forms as directed

Competency 8.4: Strain urine

Competency Builders:

8.4.1 Provide instructions for clients whose urine needs to be strained
8.4.2 Collect necessary supplies
8.4.3 Assist in the straining of urine as requested
8.4.4 Report observations
8.4.5 Fill out laboratory requests as directed

Competency 8.5: Collect stool specimens

Competency Builders:

8.5.1 Collect necessary supplies
8.5.2 Identify the characteristics of normal stool
8.5.3 Follow established procedures in collecting and disposing of stool specimens
8.5.4 Report results and/or observations

Unit 9: Care of Elderly Clients

Competency 9.1: Demonstrate knowledge of the aging process and its effects

Competency Builders:

9.1.1 Identify influences of aging on personality development
9.1.2 Identify ways to help elderly clients accomplish developmental tasks by encouraging independence and optimal self-care
9.1.3 Identify the skills necessary to support appropriate behavior and allow clients to make personal choices and maintain their dignity
9.1.4 Identify the principles of behavior management (e.g., reinforce appropriate behavior, implement strategies to reduce or eliminate inappropriate behavior)
9.1.5 Identify age-related physical changes in each body system
9.1.6 Identify mental changes related to aging
9.1.7 Identify social and sexual changes related to aging
9.1.8 Identify appropriate responses to sexuality issues, including the handling of perceived sexual advances by a client
9.1.9 Identify special safety concerns in the care of elderly clients
9.1.10 Identify stereotypic myths concerning the elderly
9.1.11 Identify basic facts and statistics related to the elderly

Unit 12: Office Procedures

Competency 12.1: Maintain medical records

Competency Builders:

12.1.1 File information in accordance with office protocol
12.1.2 Prepare client records
12.1.3 Process incoming medical reports
12.1.4 Store inactive records
12.1.5 Audit records

Competency 12.2: Maintain appointment books

Competency Builders:

12.2.1 Prepare appointment book
12.2.2 Coordinate appointments
12.2.3 Maintain recall system
12.2.4 Confirm appointments
12.2.5 Make referral appointments for clients

Competency 12.3: Perform reception duties

Competency Builders:

12.3.1 Open office
12.3.2 Monitor office neatness
12.3.3 Manage reception area
12.3.4 Demonstrate telephone techniques
12.3.5 Greet/dismiss visitors and clients
12.3.6 Assist clients with special needs (e.g., physically challenged)
12.3.7 Manage children accompanying clients
12.3.8 Screen non-client visitors
12.3.9 Explain delays to clients
12.3.10 Operate office equipment
12.3.11 Maintain office equipment
12.3.12 Manage correspondence
12.3.13 Maintain client record files
12.3.14 Close office

Competency 12.4: Maintain client accounts in accordance with office protocol

Competency Builders:

12.4.1 Apply basic bookkeeping fundamentals
12.4.2 Prepare ledger
12.4.3 Record charges and credits
12.4.4 Interpret the physician's/dentist's fees
12.4.5 Compose itemized statements
12.4.6 Process collections
12.4.7 Prepare aged account reports
12.4.8 Process client inquiries and insurance claims
12.4.9 Perform electronic billing*

Competency 12.5: Identify the requirements of the payment system

Competency Builders:

12.5.1 Follow the required procedures for private insurance carriers
12.5.2 Follow office protocol for self-pay
12.5.3 Follow the required procedures for government-insured clients
12.5.4 Complete forms specific to given payment system

Competency 12.6: Report treatment information using established diagnostic coding

Competency Builders:

12.6.1 Access needed information using code reference manuals
12.6.2 Complete forms using the coding of the international classification of diseases (IC-9 CM)
12.6.3 Complete forms using the coding of current procedural terminology (CPT)
12.6.4 Complete forms using the coding of the health care procedural code (HCPC)
12.6.5 Complete forms using the coding of diagnostic related groups (DRGs)

Unit 13: Communications

Competency 13.1: Identify common medical and dental abbreviations, symbols, and terms

Competency Builders:

13.1.1 Define medical prefixes, suffixes, and word roots
13.1.2 Identify common medical, dental, and pharmacological terms and their abbreviations
13.1.3 Use medical and dental abbreviations, symbols, and terms in context
13.1.4 Use standard professional terminology in all aspects of practice

Competency 13.2: Apply effective verbal and nonverbal communication skills

Competency Builders:

13.2.1 Follow written and oral instructions
13.2.2 Clarify instructions
13.2.3 Apply listening skills
13.2.4 Identify types of interpersonal communication
13.2.5 Identify the essential role of effective communication in all phases of health care
13.2.6 Identify techniques of effective verbal and nonverbal communication
13.2.7 Identify barriers to communication
13.2.8 Identify ways to improve verbal communication
13.2.9 Apply techniques for communicating with behaviorally or emotionally impaired clients
13.2.10 Apply techniques for communicating with mentally impaired clients
13.2.11 Apply techniques for communicating with clients with limited English proficiency or no English language ability
13.2.12 Apply techniques for communicating with hearing-impaired, speech-impaired, and vision-impaired clients
13.2.13 Apply techniques for communicating with clients with physical impairments
13.2.14 Interact one-on-one with clients

Continued

Competency 13.2: ***Apply effective verbal and nonverbal communication skills****—Continued*

13.2.15 Demonstrate sensitivity to clients' emotional, social, and mental health through skillful, directed interaction
13.2.16 Identify the adjustments in communication techniques necessary for different levels of client understanding
13.2.17 Place/receive phone calls
13.2.18 Communicate using an intercom system
13.2.19 Educate clients in the placement and use of the call system (signal light or button)
13.2.20 Identify the impact of the aide's/assistant's attitude on his or her ability to communicate and interact effectively with clients, family members, and fellow staff members
13.2.21 Identify the procedure for answering a client's call signal
13.2.22 Identify the person responsible for keeping the client informed about his or her medical condition
13.2.23 Distinguish between factual reports and personal opinion
13.2.24 Perform communication functions using basic computer skills
13.2.25 Apply accepted rules for spelling, grammar, and punctuation in written and oral communications
13.2.26 Write legibly

Competency 13.3: Document information

Competency Builders:

13.3.1 Collect data
13.3.2 Organize data
13.3.3 Draft documents in accordance with basic grammar rules
13.3.4 Utilize standard dental, medical, and pharmacological terminology in documenting information
13.3.5 Proofread documents
13.3.6 Edit documents
13.3.7 Correct documents based on proofreading/editing

Job Profiling—How It Works

VIML's Job Profiling process was initiated by mailing surveys to current workers in OCAP occupations all across Ohio. The survey's purpose: to have actual workers in specific occupations rate job tasks according to each task's frequency and criticality—that is, the amount of time spent performing each task relative to other tasks and the importance of each task to overall job performance.

To complete the survey, participants examined OCAP competencies for their occupation. Based on the survey's results, VIML staff produced a list of the most critical competencies in each occupation.

The next stage of Job Profiling was to convene committees of subject-matter experts to perform "leveling," which involved the following tasks:

- Examining the frequency and criticality competency lists for an occupation
- Reviewing the levels associated with each of the seven Work Keys academic skills: *Locating Information*, *Reading for Information*, *Applied Mathematics*, *Applied Technology*, *Listening*, *Writing*, and *Teamwork*
- Identifying the level of skill students must master relative to each Work Keys academic skill in order to successfully perform the occupational competencies

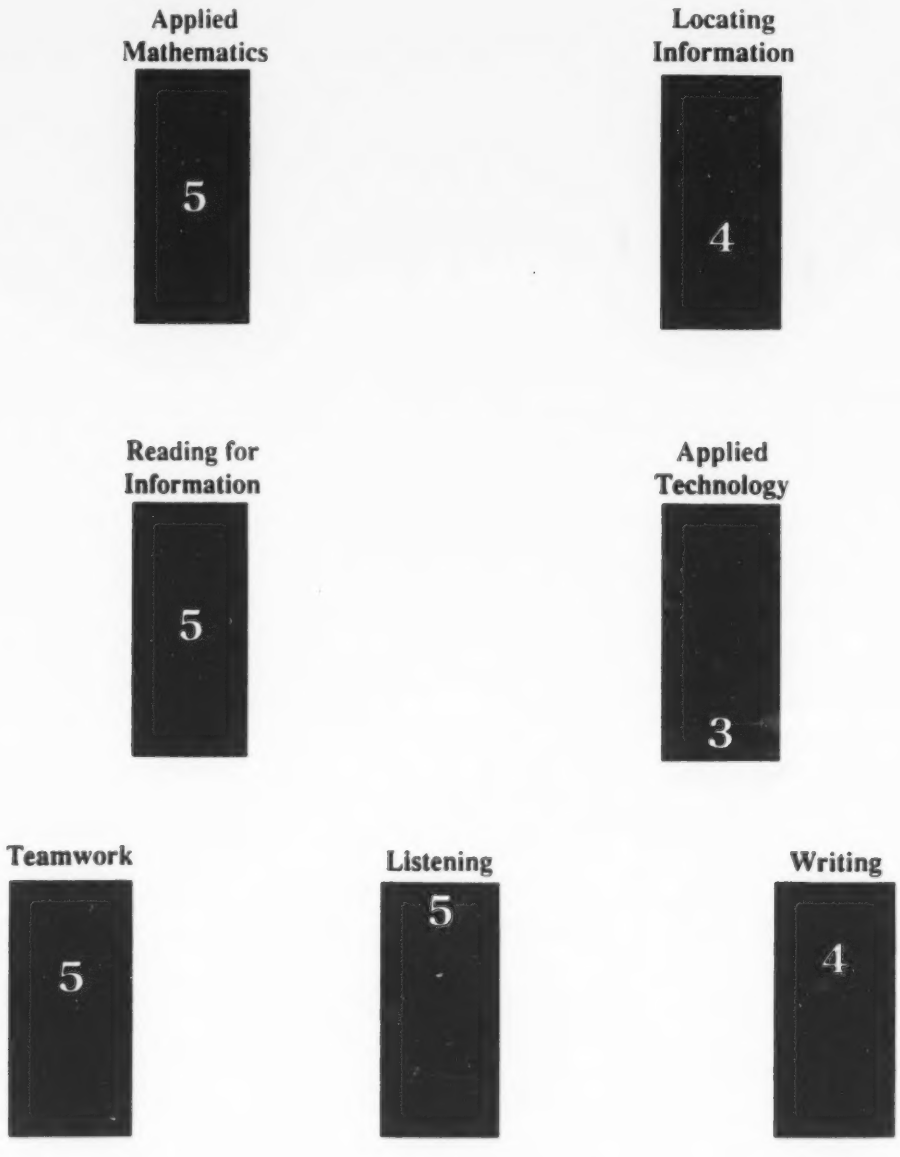
Finally, in 1995, the initial leveling of Work Keys academic skills for the occupational area covered by this OCAP was revalidated by the new panel of expert workers convened to update the OCAP (see inside back cover).

Example of Job Profiling

For every occupational area, there are shaded graphs to represent each of the seven Work Keys academic skills. Each graph shows the range of levels for that particular skill; the shading represents the academic skill level required by an entry-level worker in that occupation, as determined by the Job Profiling committee. For example:

In the example shown, Applied Mathematics has a skill range of 3–7. The required skill level, determined by Job Profiling and shown by the highlighting, is 6.

Academic Job Profile: Diversified Health Occupations



Academic Competencies: Diversified Health Occupations

Panels of expert workers (see member lists on the inside back cover) identified the following academic competencies (from the total list, pp. 58-72) as most crucial to the success of an entry-level nurse-aide, medical assistant, or dental assistant. It is recommended that these competencies be taught in an applied manner for students enrolled in diversified health occupations programs.

Unit: Communications Literacy

Subunit: Reading—Structure

Competencies:

RS1	Exhibit knowledge of language structure
RS2	Recognize that there may be more than one interpretation of reading selections
RS5	Develop and use an increasingly sophisticated vocabulary gained through context
RS6	Apply knowledge of language structure to reading
RS7	Explain why there may be more than one interpretation of reading selections
RS10	Recognize relationship of structure to meaning
RS15	Apply an expanding vocabulary gained through reading

Subunit: Reading—Meaning Construction

Competencies:

RM2	Describe effectiveness of a reading selection
RM3	Read to clarify personal thinking and knowledge
RM4	Support interpretation of text by locating and citing specific information
RM7	Engage in self-selected reading activities
RM8	Confirm and extend meaning in reading by researching new concepts and facts
RM9	Self-monitor and apply corrective strategies when communication has been interrupted or lost
RM12	Use reading as a possible problem-solving strategy to clarify personal thinking and knowledge
RM17	Clarify meaning when reading, using knowledge of literary devices, stylistic diction, and other semantic elements
RM20	Use reference books to find, evaluate, and synthesize information

Subunit: Reading—Application

Competencies:

RA1	Select and read material for personal enjoyment and information
RA3	Employ various reading strategies (e.g., scanning, skimming, reviewing, questioning, testing, retaining) according to purpose
RA5	Develop and apply knowledge of the interrelationship of concepts (e.g., construction of webs, graphs, timelines)
RA7	Extend value of reading, writing, speaking, viewing, and listening by pursuing, through reading, new concepts and interests developed as a result of these activities

Subunit: Oral Communication—Structure

Competencies:

OS1	Refine oral communication skills (e.g., voice modulation, eye contact, body language)
OS2	Demonstrate knowledge of grammar, usage, and syntax when presenting
OS3	Select topics and vocabulary suitable to audience
OS4	Organize notes and ideas for speaking (e.g., cause-effect, chronological, exemplification)
OS7	Organize notes and ideas for formal, semiformal and informal presentations of information
OS8	Refine speaking techniques for formal, semiformal, and informal settings
OS9	Develop repertoire of organizational strategies for presenting information orally
OS10	Expand vocabulary to fit topic
OS11	Select topics suitable to audience, situation, and purpose

Subunit: Oral Communications—Meaning Construction

Competencies:

OM1	Make connections between prior knowledge and new information for oral presentations
OM2	Participate in informal speaking activities (e.g., offering opinions, supporting statements, questions, clarification, entertainment)
OM3	Use interviewing techniques to gather information
OM4	Communicate orally to entertain and to inform
OM5	Participate in group communication activities (e.g., debates, panel discussions, negotiations, book-sharing, roundtables, cooperative/collaborative groups)
OM6	Take and organize notes when preparing speech/presentation
OM8	Respond to needs of various audiences
OM9	Gather and assess information for speaking
OM10	Communicate orally to inform and persuade
OM13	Assess needs of audience, and adjust language and presentation according to their knowledge
OM17	Analyze and synthesize information gathered from a variety of sources (e.g., interviews, hypermedia, reference works) for speaking
OM20	Describe topic or idea to clarify meaning for others

Subunit: Oral Communication—Application

Competencies:

OA1	Become proficient at using interviewing techniques
OA3	Develop and apply oral communication skills for cooperative/collaborative learning
OA5	Develop and apply decision-making strategies
OA6	Practice interviewing techniques
OA7	Apply interviewing techniques to purposeful interviews
OA8	Focus oral interpretation on a specific audience

Subunit: Oral Communications—Multidisciplinary

Competencies:

OM1	Value thinking and language of others
OM4	Participate actively in a community of learners

Unit: Mathematics Literacy

Subunit: Numbers and Number Relations

Competencies:

NR1	Compare, order, and determine equivalence of real numbers
NR2	Estimate answers, compute, and solve problems involving real numbers

Subunit: Measurement

Competencies:

M1	Estimate and use measurements
M2	Understand need for measurement and the probability that any measurement is accurate to some designated specification
M9	Construct and interpret maps, tables, charts, and graphs as they relate to real-world mathematics
M16	Develop an ability to identify real problems and provide possible solutions
M17	Express and apply different types of measurement scales

Subunit: Estimation and Mental Computation

Competencies:

E1	Use estimation to eliminate choices in multiple-choice tests
E2	Use estimation to determine reasonableness of problem situations in a wide variety of applications
E4	Use mental computation when computer and calculator are inappropriate

Subunit: Data Analysis and Probability

Competencies:

D1	Organize data into tables, charts, and graphs
D7	Read, interpret, and use tables, charts, and graphs to identify patterns, note trends, draw conclusions, and make predictions

Subunit: Algebra

Competencies:

A1	Describe problem situations by using and relating numerical, symbolic, and graphical representations
A2	Use language and notation of functions in symbolic and graphing settings
A3	Recognize, relate, and use the equivalent ideas of zeros of a function, roots of an equation, and solution of an equation in terms of graphical and symbolic representations
A7	Make arguments and proofs in algebraic settings
A11	Explore factoring techniques
A14	Solve systems of linear equations with two variables
A15	Describe geometric situations and phenomena using variables, equations, and functions

Continued

Subunit: Algebra—Continued

A17	Represent inequalities on the number line and in the coordinate plane
A24	Represent sequences and series as functions both algebraically and graphically
A26	Describe and solve algebraic situations with matrices
A28	Analyze and describe errors (and their sources) that can be made when using computers and calculators to solve problems
A29	Decide whether problem situation is best solved using computer, calculator, paper and pencil, or mental arithmetic/estimation techniques
A37	Simplify algebraic expressions

Unit: Science Literacy

Subunit: Scientific Inquiry

Competencies:

Q1	Check the appropriateness and accuracy of measures and computations using various strategies (e.g., estimations, unit analysis, determination of significant figures)
Q2	Use ratios, proportions, and probabilities in appropriate problem situations
Q3	Translate information from and represent information in various forms with equal ease (e.g., tables, charts, graphs, diagrams, geometric figures)
Q7	Identify, compare, and contrast different modes of inquiry, habits of mind, and attitudes and dispositions
Q8	Design investigations that are safe and ethical (i.e., obtain consent and inform others of potential outcomes, risks, and benefits; and show evidence of concern for health and safety of humans and non-human species)
Q9	Make and read scale drawings, maps, models, and other representations to aid planning and understanding
Q11	Use appropriate units for counts and measures
Q14	Communicate the results of investigations clearly in a variety of situations
Q15	Examine relationships in nature, offer alternative explanations for the observations, and collect evidence that can be used to help judge among explanations
Q17	Select, invent, and use tools, including analog and digital instruments, to make and record direct measurements
Q18	Observe and document events and characteristics of complex systems
Q19	Explain the influence of perspective (e.g., spatial, temporal, and social) on observation and subsequent interpretations
Q22	Document potentially hazardous conditions and associated risks in selected homes and public areas
Q24	Construct and test models of physical, biological, social, and geological systems
Q25	Read, verify, debate, and, where necessary, refute research published in popular or technical journals of science (e.g., *Discover*, *Omni*, *Popular Mechanics*)
Q26	Explore discrepant events and develop and test explanations of what was observed
Q28	Modify personal opinions, interpretations, explanations, and conclusions based on new information
Q33	Analyze the changes within a system when inputs, outputs, and interactions are altered
Q34	Create, standardize, and document procedures
Q37	Recognize and utilize classification systems for particles, elements, compounds, phenomena, organisms, and others for exploring and predicting properties and behaviors

Subunit: Scientific Knowledge

Competencies:

K5	Investigate degrees of kinship among organisms and groups of organisms
K6	Investigate the limits of the definition of life, and investigate organisms and physical systems that exist at or near these limits (e.g. viruses, quarks, black holes)

Subunit: Conditions for Learning Science

Competencies:

C1	Participate actively in dialogue about and resolution of community issues
C8	Consider the scientific thinking and language of others
C13	Collect, store, retrieve, and manipulate information with available technologies that may range from hand processes up through computer applications
C20	Wonder about the likelihood of events that may occur by chance or coincidence
C23	Seek information on topics of personal scientific interest from a variety of sources
C25	Listen attentively and critically to presentations of scientific information made by others
C29	Access appropriate technology to perform complicated, time-consuming tasks
C33	Use technology (e.g., desktop publishing, teleconferencing, networking) to communicate scientific ideas
C36	Respect the scientific thinking of others and self
C51	Refine scientific skills from a variety of experiences

Subunit: Applications for Science Learning

Competencies:

A3	Propose courses of action that will validate and demonstrate personal understandings of scientific principles
A5	Promote and carry out practices that contribute to a sustainable environment
A7	Choose consumer materials utilizing personal and environmental risk and benefit information
A9	Do simple troubleshooting on common electrical and mechanical systems, identifying and eliminating possible causes of malfunctions
A12	Make decisions regarding personal and public health
A13	Evaluate the social and ecological risks and benefits resulting from the use of various consumer products
A15	Identify and reduce risks and threats to a sustainable environment
A16	Extend the limits of human capabilities using technological enhancements
A19	Choose everyday consumer products that utilize recent innovation and pass appropriate performance criteria
A25	Use scientific evidence to consider options and formulate positions about the health and safety of others and self
A26	Search for, use, create, and store objects and information using various strategies and methods of organization and access
A30	Refine personal career interests
A34	Make informed consumer choices by evaluating and prioritizing information, evidence, and strategies
A36	Differentiate between observations and inferences in the exploration of evidence related to personal, scientific, and community issues

Center on Education and Training for Employment
College of Education; The Ohio State University
1900 Kenny Road
Columbus, Ohio 43210-1090

(614) 292-8300 (project)
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